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ELEMENTS

OF

GENERAL PATHOLOGY.

ELEMENTS

OF

GENERAL PATHOLOGY;

BY THE LATE

JOHN FLETCHER, M. D.

EDITED BY

JOHN J. DRYSDALE, M. D.

AND

JOHN R. RUSSELL, M. D.

EDINBURGH:

MACLACHLAN, STEWART, & COMPANY.

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PREFACE.

Rich as our literature is in most of the practical departments of medical science, it is remarkable that it scarcely contains a single comprehensive work on General Pathology. Nor is it difficult to understand why practical men, although capable of writing excellent treatises on practical subjects, should consider themselves unqualified to supply this deficiency.

As physiology is the science of healthy vital action, so pathology is that of diseased action; the body being disorganized, and its functions impaired, by laws as certain as those by which it is constructed and maintained. Since the principles in both are the same—the difference lying in their application only—pathology must evolve itself from physiology; and it is to the

physiologist therefore we must look for a satisfactory pathological system.

Those readers who are acquainted with Dr Fletcher's "Rudiments of Physiology," will find his "Elements of Pathology" characterized by the same philosophic spirit, extensive erudition, elegance of diction, depth of thought, and largeness of view, that distinguished the former work, of which indeed this was intended to have been a continuation.

The Editors are but too conscious that the work is not what it would have been had the Author lived to complete it for the press; but, in arranging the MSS. put into their hands (notes of lectures, often scarcely intelligible), they have endeavoured to discharge their duty to the Author in his own spirit; and hope that, while gratifying the wishes expressed by many of his pupils, they are at the same time doing good service to the profession at large, by presenting them with a treatise so admirable in its plan and enlarged in its scope. They have scrupulously adhered to the Author's text, and

have added in editorial notes what seemed necessary to completeness, and sufficient to put the reader in possession of what has been done in the science up to the present time.

In doing so, however, they have carefully abstained from obtruding any opinions of their own; and while they have confined themselves to the statement of facts, and of the opinions of others, they have never withheld any because they were opposed to the views of the Author, knowing that it never was his wish to gain credit to his doctrines by suppressing or evading what might be urged against them.

The literature is not so entirely separated from the details of the science as it is in the Rudiments of Physiology, since the Editors could not have done so without taking more liberties with the text than they thought themselves entitled to do.

In that part of the work which treats of auscultation, the Editors have taken the liberty of substituting, for the doctrines of Laennec, the modification of those introduced by Skoda of

Vienna, as furnishing the simplest and clearest exposition of the present state of the science. They have also introduced into the text some recent observations by Rokitansky on the mutual relation of certain diseases.

J. J. D.
J. R. R.

18 RODNEY STREET, LIVERPOOL,
19 RUTLAND SQUARE, EDINBURGH, } *March* 1842.

TABLE OF CONTENTS.

What is included between brackets has been added by the Editors.

BOOK FIRST.

ETIOLOGY.

Page.

CHAP. I.

REMOTE CAUSES OF DISEASE.

CHAP. II.

EXCITING CAUSES.

Page.

CHAP. III.

LIGHT—ELECTRICITY—AIR.

CHAP. IV.

ALIMENT.

CHAP. V.

SYMPATHY, AND THE PASSIONS.

Page.

CHAP. XVI.

FUNCTIONAL PROXIMATE CAUSES.

BOOK SECOND.

SEMIOLOGY.

CHAP. I.

NOSOLOGY.

CHAP. II.

ANATOMICAL SYMPTOMS.

CHAP. III.

RESPIRATION.

Page.

CHAP. VIII.

THOUGHT.

CHAP. IX.

VOLUNTARY MOTION.

BOOK THIRD.

THERAPEUTICS.

CHAP. I.

PROPHYLACTIC TREATMENT.

CHAP. II.

MEDICINES.

SIO

URINA	ANS OF THOUGHT.	ORGANS OF VOLUNTARY MOTION.
ritis—C	Neuralgia—Encephararachnitis.	Inflammation of Bones—Periostitis—Inflammation of Ligaments—Rheumatism—Gout.

ETIOLOGY,

OR THE CONSIDERATION OF THE INFLUENCE OF THOSE AGENTS UPON THE BODY, BY WHICH DISEASES ARE OCCASIONED.

CHAP. I.

DISEASE AND PROXIMATE CAUSE—PREDISPOSING CAUSES—AGE—SEX—TEMPERAMENT—IDIOSYNCRASY—HABIT OF BODY—CLIMATE—DIET.

THE causes of diseases are commonly said to be either remote or proximate, and the former are subdivided into the *predisposing* and the *exciting*. A predisposing cause may be defined to be some *permanent condition* of the body, which, though insufficient under ordinary circumstances to produce a morbid change, still, in co-operation with an exciting cause, does so; and an exciting cause may be defined to be *some accidental variation of the circumstances* affecting the body, which, though likewise insufficient in itself to produce a morbid change, may still co-operate with a predisposing

cause in so doing.* Lastly, a proximate cause may be defined to be some morbid change, either structural or functional, in the body itself, excited by the two former, and in its turn immediately giving rise to the disease. To this excitement, as far as it is healthy, two conditions have been represented as necessary; a natural susceptibility on the part of the body of being affected, and certain natural stimuli capable of calling the susceptibility into action: the result is a series of healthy actions, giving rise to a healthy function.

To the same excitement, as far as it is morbid, two conditions are likewise in general necessary; a preternatural susceptibility on the part of the body of being affected, and certain preternatural stimuli capable of calling this susceptibility into action: the result is a series of morbid actions, giving rise to a disease. They vary therefore only in degree, and the business of Etiology and Semiology is consequently nothing more than the consideration of preternatural irritability, or predisposing cause,—and preternatural stimuli, or exciting causes,—and preternatural functions, or diseases.

With respect to the general admission of the two heads of remote causes above proposed, almost all persons are agreed that it is founded in common sense, and, as established with a view to practical utility, must not be tried by the rules of scholastic argumentation. Every body is aware, that if two persons of different

* Neither health (*i. e.* natural action) nor disease (*i. e.* morbid action) are entities, but abstractly signify different modes of being, or the same mode of being under different circumstances. "Health and disease," says John Brown, "are the same state, the excitement varying only in degree." Both require the same irritability and the same stimuli, but they require them in different degrees.

constitutions be exposed to the same accidental circumstances, one is frequently affected with a peculiar disease, while the other escapes; and that the same often occurs when two persons of the same constitution are exposed to different accidental circumstances. The constitution of the affected person therefore in the former case, and the accidental circumstances to which the affected person was exposed in the latter, we set down with reason as respectively a predisposing and an exciting cause of the disease in question, and this whether we can explain the mode and boundaries of their action or not. But with respect to the admission of a proximate cause, there is much less approach to unanimity; and indeed the existence of such a cause is in the present day very generally, but, as it appears to us, very injudiciously questioned. In nine cases out of ten, a medical man, called on to define a proximate cause of a disease, will reply that he knows of no distinction between this cause and the disease itself, and that, in his view of the matter, the terms are synonymous. But this is to confound all distinction between what is often hidden and what is always manifest, and implies a very inadequate conception of what constitutes, strictly speaking, a disease. A disease is analogous to a healthy function; a proximate cause to the mechanism of that function. We may recognise the one without knowing any thing about the other. If the discharge from the nostrils in catarrh, and the yellow colour of the skin and eyes in jaundice, be distinct respectively from an inflammation of the Schneiderian membrane, and an obstruction of the biliary ducts whence these symptoms proceed; if what a person, ignorant even of the existence of

such a membrane, or such ducts, immediately perceives and recognises, be distinct from what a medical man arrives at only by study and observation; if, in a word, Semiology and Pathology be distinct sciences, a disease is not identical with a proximate cause, but something resulting from it, and separated from it by a very distinct line of demarcation. It bears nearly the same relation to a proximate cause which a shadow does to the substance which produces it; and as the shadow is the immediate and evident effect of the interposition of this substance, so as to intercept the rays of light, whether the substance be obvious or not, so a disease is the immediate effect of its proximate cause, which, in like manner, may or may not be obvious; in other words, it is merely an abstract term, by which we signify certain phenomena, without any reference to their immediate origin.

In short, if by the term disease we choose to understand, not an entity, any more than life or healthy action is an entity, but a collection of symptoms, such as it is set forth without comment by the merely practical physician, the separate existence of the proximate cause, or the actual entity when the disease occurs, and the investigation of which is the business of the pathologist, will be abundantly manifest: if we do not, we must be contented, in abolishing the term proximate cause, to use the term disease to signify two things as distinct from each other, literally speaking, as light from darkness. The definition which we choose to give of a disease is in a great measure arbitrary. We may make this, if we please, the entity; we may define it a certain morbid condition; but if we do so, we have no term whatever to designate that

abstract collection of symptoms which results from this morbid condition of the body, and which is always sufficiently manifest, although this morbid condition may be very obscure. It is surely better, then, to call by the name of a disease such a collection of symptoms, and by the name of a proximate cause such a morbid condition of the body, as immediately gives rise to them.*

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* The first notions entertained of the distinctions between a proximate cause and a disease were much more accurate than those which subsequently gained ground. "A cause," says Cælius, "viz. a proximate cause, inasmuch as it is hidden, may be regarded in different lights, according to the fancy of different persons; but a disease, or the symptoms which arise from such a cause, are always prompt and obvious and intelligible to all." A disease is what is described without comment by such writers as Hippocrates, Aretæus, and Sydenham, while a proximate cause is what was either seen by such writers as Bonnet, Morgagni, and Baily, or imagined by such as Willis, Stahl, and Brown, the former of whom wrote on organic proximate causes (and Morgagni, in particular, entitles his great work on pathological anatomy, De Sedibus et *Causis* Morborum, as if aware that it was not on diseases, but on causes, that he was writing), and the latter on functional proximate causes. No one is at a loss to perceive the difference in the general tenor of the writings of these celebrated men, and no one needs be at a loss to distinguish between a disease and a proximate cause. It was perhaps Galen who introduced confusion into this subject, by defining a disease at one time as an injury either of function or of organization, and at another as itself a symptom, meaning by a symptom that which follows such an injury. Now it is evident that the former definition applies in fact to a proximate cause, and the latter alone to a disease; and it was from having thus exhausted every thing upon the definition of a disease that he was driven to say of a proximate cause (what has been so hackneyed since his time), that it is that cause which, when present, the disease is present, when changed, the disease is changed, when removed, the disease is removed; which conveys no idea whatever of causation, but only of essential connexion, and which, although it did convey an idea of causation, would still give no clearer conception of

It is from this vague apprehension of the distinction between a proximate cause and a disease, that has arisen the false notion so often inculcated, that it is merely a part of the disease, and therefore not a cause at all; as well as the equally false notion insisted on by Dr Parry, that a disease is co-existent with a proximate cause, and therefore cannot be an effect. We may as well however deny that respiration is the effect of the motions of the chest, or that a shadow is the effect of the interposition of an opaque body between the light and a third object, because it takes place without any appreciable interval, as deny that a disease is the effect of a proximate cause.

The predisposing causes of disease commonly cited relate to some more or less permanent peculiarity with respect to the susceptibility of the body, and include every thing relating to age, sex, temperament, and idiosyncrasy, and to habit of body, however induced.

The exciting causes, on the contrary, relate to some adventitious peculiarity with respect to the stimuli acting upon the body, and include every thing relating to either the common agents upon it, as *caloric*, *light*, *electricity*, *air*, *aliment*, *sympathy*, and the *passions*; or to some uncommon ones, as *pressure*, *blows*, *wounds*, *poisons*, applied directly to the skin, and so forth, as well as to some peculiarities with respect to exercise and sleep; and these co-operate with the preceding in producing proximate causes, either directly or (as

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the nature of a proximate cause, than it would of the nature of a good fire, to be told that it was something which, when present, we feel warm, when diminished, we feel chilly, and when removed, we feel cold; a definition which is applicable to many other things as well as a good fire.

is sometimes supposed) through the medium of the blood, which, however, considered merely in the light of a stimulus, as we have hitherto considered it, if a cause of disease at all, must be referred to the head rather of exciting than of proximate causes. Lastly, the proximate causes relate to some peculiarity either of organization or function; the former including inflammation, whether unattended or attended by fever and its frequent consequences, such as induration, hypertrophies, preternaturally increased secretions, the deposition of false tissues, the displacement of parts, and every other visible change affecting the body; the latter every increased, irregular, or diminished action of the several parts, such as spasms, convulsions, palsies, &c., without any visible change in their organization.

To begin, then, with predisposing causes, which, it must be remembered, become such only by producing some peculiarity in the susceptibility of the body, and operate in producing diseases only in conjunction with the exciting causes, and through the medium of the proximate. They include the consideration of *age*, *sex*, *temperament*, *idiosyncrasy*, and *habit of body*, however induced. We shall begin with age.

The periods of the life of man usually enumerated are, infancy, childhood, adolescence, adult age, and senescence, the two latter being sometimes subdivided each into incipient, confirmed, and declining. The first period (infancy) begins, of course, at birth, the second may be considered to begin about the seventh year (childhood), the third in males about the sixteenth year (adolescence or puberty), the fourth about the twenty-fifth year (adult age), and the fifth about

the fiftieth year (senescence). The three last periods, viz. those of adolescence, adult age, and senescence, may be considered to begin in females about two years earlier.

With respect to old age as *per se* a cause of death, we have already mentioned, that to terminate their existence by death is as clear a characteristic of living beings as to *owe* their existence to a pre-existing germ. The extreme term in every class is more or less definite, and in man not less so than in the rest; but as he is longer of coming to perfection than almost any other animal of the class Mammalia, so the duration of his life is naturally greater.

It is pretty certain, that, from the latest ages of which we have any authentic accounts, the common duration of life has been pretty nearly the same as at present. "The days of our years are threescore and ten," says the oldest writer extant; but comparatively very few have reached that age at any period, and far fewer in ancient times than at present. Herodotus asserts that three generations pass away in one century, giving the whole human race an average chance of rather more than thirty-three years of existence; but this chance (contrary to the common opinion) is considerably better now than formerly. The mean duration of life in Ancient Rome has been computed to have been about 30 years; while in France it is estimated now at 42, and in Great Britain, the healthiest country in the world, at 45.

In Rome,* in the third century, the probability of life was,

* Hawkins' Med. Statis. p. 8; quoted from Berard, Discours sur les

From birth	to	20 years of age,		30 years.	
—	20	— 25	—	28	—
—	30	— 35	—	22	—
—	35	— 40	—	20	—
—	40	— 45	—	18	—
—	45	— 50	—	13	—
—	50	— 55	—	9	—
—	55	— 60	—	7	—
—	60	— 65	—	5	—

In Great Britain at present the probability of life is,

At 20,	33	At 60,	13
— 30,	28	— 70,	8
— 40,	23	— 80,	3
— 50,	18		

All this, however, depends upon our less exposure now than formerly to the causes of disease, and our better treatment of them when they do occur, not to any difference in the natural longevity of man.

It appears, from returns which have been made from all parts of England to the Home Office, commencing July 1831, but which it is not proper to go into here, that, of 100 persons born, upon an average

48	only reach	10	years of age,
42	—	20	—
35	—	30	—
29	—	40	—
24	—	50	—
18	—	60	—
10	—	70	—
4	—	80	—

Améliorations, &c. p. 69. Vide Justin. Pandect. lib. 35, tit. 2, ad legem Falcidiam.

The final period is still the same, although a greater number now arrive at the goal.

With respect to the diseases to which various ages give a predisposition; in the general way, it may be said, perhaps, that persons in early life are more prone than at any other time to diseases of the head, that persons in middle life are more prone than at any other period to diseases of the chest, and that persons in old age are more prone than at any other period to diseases of the belly.* Among the individual diseases with which infants are liable to be affected, may be enumerated tabes mesenterica, diarrhœa, intus-susceptio, congenital hernia, and prolapse of the anus; congenital catarrh, parulis, aphthæ, strophulus, rubeola, scarlatina, pityriasis, purulent ophthalmia, polysarcia, varicella, erysipelas, variola, frambæsia, arachnitis, hy-

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* The first of these may depend upon the greater activity of the capillary arteries of the head in infancy, from which results the disproportionate development of this organ. The second may result from the greater irritability of the capillary arteries of the lungs and chest, by which we explain the disproportionate development of these organs in adolescence and adult age, when the paramount importance of these organs chiefly displays itself, and the necessity for bodily labour is the greatest. The greater liability to disease in the belly in senescence does not depend upon the greater irritability of the capillaries of the intestines, but upon the increased stimulus to which they are exposed during the venous plethora which we have already described as occurring in senescence, and which perhaps operates in impeding the course of the blood principally in the lower vena cava, and consequently overloading the corresponding parts of the arterial system, by which we explain the disproportionate development of these organs at this period of life, and their consequent liability to disease. In all cases, the more any organs are worked, the more they are liable to become diseased. Hence the lungs and kidneys are the seat of disease in cold, the liver and skin in hot, climates.

drocephalus, rachitis, pertussis, trismus, and epilepsy. Of these, purulent ophthalmia arises generally from the contact of a specific poison; and rubeola, varicella, variola, frambæsia, and pertussis, always perhaps from specific contagions, which, as they affect the body only once in a lifetime, take effect, of course, only the first time a person is exposed to them, which is generally during infancy. In these cases, then, the age does not afford any real predisposition; but to the rest of the above-mentioned diseases infants are certainly predisposed, owing to the peculiarity in the structure or function, either of the organs immediately involved, or of other organs (as the stomach and bowels, at this time so generally affected with gastro-enteritis, by the process of dentition) with which the former have a remarkable sympathy, whence appear to arise tubercles of the intestinal glands, diarrhœa, parulis, aphthæ, strophulus, pityriasis, erysipelas, arachnitis of the ventricles of the brain and its consequences, hydrorachitis, and hydrocephalus, perhaps also rachitis, as well as trismus, epilepsy, and other diseases. Of the nature of the link by which these diseases are connected with gastro-enteritis we shall speak in future. The general tendency, however, to spasmodic and convulsive diseases in infants will be easily understood, if we consider the imperfect state of their animal functions already alluded to. Of the remaining diseases to which children are particularly subject, we may enumerate cynanche trachealis and bronchitis (arising, according to M. Good, from a specific irritability); intus-susceptio; congenital and umbilical hernia; prolapsus ani, from laxity of the gut, or great action of the muscles; epistaxis, from specific irritability; polysarcia, from

external circulation, and consequently increased secretion; malformation of heart, producing cold of surface; and inflammation, giving origin to coagulable lymph; scrophula; worms; urinary calculi of phosphates; tabes mesenterica; encephaloid tumours of testicle; otitis; encephaloid tumours of eye; abscesses of the vertebræ, acetabulum, and extremities of the femur and tibia; and chorea. Of the frequent occurrence of many of these diseases during childhood only, the same general explanation can be given as has just been offered with respect to many of the peculiar diseases of infants.

The common explanation of these peculiarities has been on the principle of increased determination of blood. Accordingly, with respect to hæmorrhages, which we may take " instar ominum," it has been usual since the time of Cullen to explain the more frequent occurrence of epistaxis in childhood, of hæmoptysis in adolescence and adult age, and of epistaxis again, together with sanguineous apoplexy and hæmorrhois, in old age, upon the supposition that, as in childhood, on the one hand, there is particular *determination* of blood to the head, in order to admit of its inordinate growth; so, in old age, on the other hand, there are particular retentions of this fluid, as well in the head as in the lower belly, owing to a supposed inordinate plenitude of the sinuses of the brain and system of the vena porta; whereas, in adolescence and adult age, when there are neither particular determinations nor particular retentions of blood anywhere, the discharge of blood, on the application of an exciting cause, will be from the pulmonary arteries, as weaker than any part of the system of the aorta. Of

this collective doctrine, however, it is sufficient to say, that however true it may be with respect to the supposed retention of the blood in particular parts in old age, with respect to the supposed determination of it to particular parts in early life, it is altogether hypothetical and improbable. The whole doctrine, moreover, is infinitely too mechanical and gross for modern times. Hæmorrhage is in general only one of a thousand diseases the seat of which is the capillary arteries, and it must be explained upon precisely the same principles as the rest, to any one of which our mechanical doctrines are rarely at present applied, and, except in cases of retention of blood from plethora, already alluded to, or of accidental compressions of the larger veins, as by the gravid uterus and tumours, depression of the skull, and valvular diseases of the heart, are perhaps never applicable.

Before the expiration of childhood, there appears to be little difference to the liability to disease depending on the difference of sex, except perhaps that boys are somewhat more frequently affected with most of the diseases just enumerated than girls; but at this period the balance is turned in favour of the male, who enjoys his greatest vigour during adolescence and adult age, while the health of the female is during these periods the most precarious. During the former, both indeed are perhaps equally liable, in the lungs to laryngitis, peripneumonia, tubercles of the lungs, and hæmoptysis, and in the stomach to dyspepsia in general, and some other diseases; but in addition to these, while males have no particular besetting disorders, if we except inguinal hernia and its consequences, for a sufficiently obvious reason, as well

as the milder forms of acne (ἴονθος, from the sprouting of the beard), and sycosis, females are subject to that modification of dyspepsia called chlorosis, to pyrosis, hæmatemesis, crural hernia, leucorrhœa, menorrhagia, palpitation of the heart, and syncope. Many of these are attributed in a great measure to the suppression of the menstrual discharge, but really depend perhaps on the affection of the stomach, from which this also proceeds. The general tendency of females to spasmodic and convulsive diseases is, of course, explicable upon the same principles as that of infants and children, viz. the less perfect state of their animal functions, which has been before more than once alluded to. To the same cause may be referred the greater liability of females to insanity.* In adult age, likewise, both males and females are perhaps equally liable to all kinds of fever, diabetes, rheumatism, and some other disorders; but, besides these, while males are still exempt from any particular affection, if we except tetanus (probably from their being more exposed than females to its chief exciting causes, cold and wounds), and, towards the close of this period, angina pectoris and asthma,†

* [Esquerol, from very extensive data taken from all countries, found the proportion of men to women, 37,825 men to 38,701 women, which, Bernoulli says, considering the difference of number of the sexes, gives a slight preponderance to male lunatics. In Germany, the proportion is 4 males to 3 females; in England, out of 7900 lunatics in private establishments, 4460 were males; in Norway, the proportion is 8 males to 7 females; in Westphalia, 10 males to 7 females; in Saxony, 10 males to 9 females; and in Russia, 2 males to 1 female.—Bernoulli, Bevölkerung-Wissenschaft.]—Editors.

† [There is much conflicting evidence with regard to the liability of the different sexes to tubercle.

females are subject, not only to all those first mentioned, as more peculiar to them, but also to numerous others more or less connected with pregnancy, parturition, and the puerperal state, such as, during the first, varix of the saphena vein, impaired circulation through the lower cava; jaundice, from direct pressure made by the stays in this state upon the biliary ducts; hæmorrhois, from the same reason as the varix just mentioned; prolapsus and retroversion of the uterus (only about the third or fourth month), miscarriage, &c.; odontalgia, from sympathy with the stomach, which is always more or less involved during pregnancy. During parturition and labour (which may be difficult from various causes), and subsequently, females are exposed to peritonitis, probably from sudden condensation, hysteria, and inflammation of mammæ, &c.; and, lastly, to phlegmasia dolens, perhaps from metastasis.*

According to Louis, females are more liable in the proportion of 7 : 5; according to the Berlin tables, of 15 : 10; while, on the other hand, according to Sir J. Clark, 10 males to 8 and a decimal of females was the average of the returns from seven different towns in Italy, France, Sweden, Germany, and America.]—Editors.

* [This seems to be the proper place to advert to some very remarkable changes that the internal surface of the skull undergoes during pregnancy, which were first observed and made known by Professor Rokitansky of Vienna, who describes a calcareous deposit as being almost constantly present there in the pregnant and puerperal state.

This deposit varies from $\frac{1}{6}$, $\frac{1}{3}$, to $\frac{1}{2}$ of a line in thickness. It appears principally on the frontal and parietal bones, especially in the course of the arterial sulci. Sometimes it is found upon the base of the skull and the frontal bones. It does not extend uniformly over the surface of the skull, but is scattered like little islands, leaving intervals quite unaffected. It may be considered as an almost invariable

By the approach of senescence, the peculiar liabilities to diseases dependent on the difference of sex again in a great measure disappears, unless perhaps the constitution of the female now becomes once more stronger than that of the male.* Among the diseases incidental to this period, men are certainly much more liable than women to hypertrophy and aneurism of the heart, and aneurism of the arteries, from the greater energy of their circulation,—to varix of the veins,

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appearance in pregnancy, and does not at all indicate any abnormity of that condition. It seems to depend upon the state of the uterus during pregnancy, as it has not been observed either in cases of extra-uterine conception, or in cases of polypi of the uterus. It has been detected as early as the third month of pregnancy.

This formation of bone has been observed in three distinct stages of development: First, as a yellowish red and gelatinous vascular condition, easily separated from the *tabula vitrea* by the knife: Second, as a thin, weak, porous, cartilaginous layer, attached by a gelatinous exudation to the skull; this is likewise easily separated by the knife: Third, as an osteo-cartilaginous plate, attached to the skull by numerous fine vessels, which must be torn through before it can be separated. These three stages of development are generally observed on the same skull.

As far as observations hitherto made lead, it would seem that such a deposition takes place at each pregnancy, and that the substance so deposited is not absorbed. Thus Rokitansky is of opinion, as well from these facts as from numerous observations, that the skull becomes permanently thickened by frequent pregnancies.

The difficulty of the healing of fractures in pregnant women stands in a curious relation to this apparent superabundance of calcareous matter in the system; but with the connection of this osteophyte with the symptoms that appear in pregnancy, and its relation to that condition of the system in general, we are as yet wholly ignorant.]—EDITORS. (Vide Oesterreich, Med. Jahrbücher, Bd. xv. s. 501.)

* [According to the following table, from observations made for 12 years, there is very little difference in the mortality of males and females of the same age, after their first year.

from their greater venous plethora,—as well as to ossification of the heart and arteries, manifestly from the greater rigidity which these tissues naturally acquire, particularly in males, as age advances. They are certainly in the same degree more liable to nephritis and urinary calculi (particularly of lithic acid), and to sanguineous apoplexy and gout :—to the two first, perhaps, partly from the more complicated structure of their urinary passages, and partly from their being more exposed to intemperance and the other exciting causes of these disorders ; to sanguineous apoplexy, partly from the same intemperance, and partly from the greater corporeal and mental exertion which they usually undergo ; to gout, from the same reasons as nephritis and urinary calculi, with which it is frequently combined.

Old persons are in general further peculiarly liable,

Out of 100 under 1 year old,	die	26·8	males,	23·0	females.	
From 1 —	to 10 —	22·0	—	22·1	—	
— 10 —	20 —	4·4	—	4·5	—	
— 20 —	40 —	10·6	—	11·7	—	
— 40 —	60 —	14·6	—	14·19	—	
— 60 —	80 —	17·8	—	19·6	—	
Above 80 —	— —	3·8	—	4·2	—	
		100		100		

The mortality of the males is decidedly greater the first year than that of the females. The proportion is, the first year, 1 female to 1·3 male; the first month, 1 to 1·4; the first day, 1 to 1·6.

In Prussia, out of 1000 born alive,

There die under 5 years old, 296 males, 270 females,
Or live to 5 years old, 704 — 730 —

So that the danger of dying before 5 is $\frac{1}{9}$th greater, and the chance of reaching 5 $\frac{1}{28}$th less, for males than females. (Bernoulli, op. cit. and Quetelet.)]—Editors.

among the local inflammations, to peripneumonia notha, ophthalmia tarsi, prurigo, carbuncles, and the several forms of acne; among the false tissues, to melanosis, and scirrhus of some of the organs; among the dropsies, to hydrothorax; and among the hæmorrhages, to epistaxis and hæmorrhois; as well as to internal accumulations of fat, as about the heart, kidneys, omentum, &c., owing to their internal circulation; and to fractures of the bones, owing to the inordinate rigidity which they have now acquired. It does not appear necessary to enter in detail any farther into this subject.

The next predisposing cause of disease that comes under consideration is *temperament.* The distinct temperaments of the body generally admitted are four,—the sanguine, choleric, melancholic, and phlegmatic.

The notions about prevalent humours, on which the names of the temperaments were founded, have for a long time been obsolete, but the names are still generally retained, as sufficiently expressive of four temperaments, certainly very different from each other, whatever may be the cause of this difference. Of these temperaments, the first, or sanguineous, is distinguished by exquisitely light flowing hair, clear blue eyes, ruddy cheeks, and slender symmetrical figure, and great vivacity; the second, or the choleric, by crisp, curly, reddish locks, gray sparkling eyes, a red-brown complexion, a firm thick-set figure, and a hasty temper; the third, or the melancholic, by stiff black hair, dark penetrating eyes, a sallow complexion, a spare gaunt figure, and great intensity of thought; and the fourth, or phlegmatic, by lank, dark, greasy hair,

dim muddy eyes, a pale, bloated, inexpressive countenance, an unwieldy and inactive carcass, and great torpor of mind. Of these several temperaments, the first is well marked, principally in early life, the second in middle age, the third at a more advanced period of life, and the last in old age; but for the most part two or more temperaments are combined together, and indeed it is rare that we meet with all the marks above described, as characteristic of any one of them in the same individual. The cause of these diversities of temperament appears to be some peculiarity in the general organism, and consequent irritability, sensibility, and faculty of thinking of the body of different individuals, of the nature of which, as of the laws of organization in general, we are almost entirely ignorant. The above enumerated temperaments are not the only ones which have been admitted by physiologists. Thus to these Cabanis added two, the muscular and nervous; and, since the time of Halle, it has been usual with the French to trace all the temperaments to some want of balance, either between the fluids and solids collectively, or between the respective tissues, and to name them accordingly.

Such is the arrangement into the firm temperaments, in which the solids, and the soft temperament, in which the fluids, are supposed to be in excess; into the sanguineous temperament, in which the sanguineous tissue, the lymphatic, in which the lymphiferous tissue, is considered to predominate; and into three others, with compound names, in which the solids and fluids, the lymphiferous and sanguiferous tissues, and the nervous and muscular, are supposed to be in a state of equilibrium. Lately, however, M. Thomas of Paris

has distinguished himself by proposing a quite original doctrine of temperaments, founded not, as before, on the prevalence of certain fluids, like that of the ancients, or tissues, like that of the rest of his countrymen, but on the comparative size (assuming, with the phrenologists, that size, *cæteris paribus*, is a measure of power) of certain organs, as the head, chest, and belly. When these are all proportioned to each other, it constitutes the mixed temperament; when either head, chest, or belly preponderate respectively, the cephalic, thoracic, or abdominal; and when the head and chest, or the head and belly, the cephalic-thoracic, or cephalic-abdominal. Of these, the three chief, viz. the cephalic, thoracic, and abdominal, distinguished; the first by talent, but without much strength or sensuality, is nearly allied therefore to the sanguine on the one hand, and melancholic on the other; the second, by strength, but not remarkable for either talent or sensuality, is nearly allied to the choleric; and the third, by sensuality, but without much talent or strength, is nearly allied therefore to the phlegmatic. In this country, however, the arrangement of temperaments first proposed is that usually adopted, however objectionable the principles upon which it is founded.

With respect to the diseases to which each of the four temperaments first described respectively predisposes the body, the more nearly the temperament of any one approaches the sanguineous, the greater is his liability, for an evident reason, to sudden attacks of acute diseases in general; but the more quickly he commonly recovers from them, and it is generally supposed that it is this temperament which is chiefly li-

able to the deposition of tubercles, &c., commonly known by the name of scrophula. The more nearly the temperament of any one approaches the choleric, the greater is his liability to less sudden but more obstinate attacks likewise of acute diseases in general, as well as to diseases of the heart and arteries, and perhaps also of the liver (hence the name): the more nearly to the melancholic, the greater his liability to chronic diseases, generally of a rigid character; as indurations, ossifications, scirrhi, &c.: lastly, the more nearly to the phlegmatic, the greater the liability also to chronic diseases; but those generally of a relaxed character, as dropsies and ulcerations. Connected with the subject of temperament is that of idiosyncrasies, or peculiar susceptibilities of inordinate impressions from certain stimuli, which many persons display in a remarkable degree, and of which every body furnishes more or less striking examples in his peculiar agreements or disagreements, his likings and antipathies.*

As the greater number of the temperaments are at-

* There is scarcely any product, animal or vegetable, that has not been revolting to some individual. Henry III. of France could not endure a cat; Tycho Brahe trembled at the sight of a hare or fox; Erasmus could not taste fish without falling into a fever; Wadislaus, king of Poland, ran away at the sight of apples; and Johannes de Querceto, secretary to Francis the First of France, would fall a bleeding if an apple were held near him. Cheese is most frequently the subject of antipathy; but we have also heard of cucumbers, and even of sweet almonds and strawberries. Carden the philosopher could not endure eggs; Crassus had an insuperable dislike to bread; and Scaliger was thrown into convulsions at the sight of cresses. The feel of velvet with some persons produces nausea and syncope: Cardinal Hauy de Cardonne swooned at the smell of a rose.

tributed, by most of the French physiologists just mentioned, to the prevalence in the body of one or other of the universally distributed tissues, so the greater number of idiosyncrasies are said to arise from a similar preponderance of one or other of the partially distributed tissues, as the mucous and fibrous, and so forth. This is a neat and pretty doctrine, to say the least of it; and, peradventure, the most of it likewise. It must be obvious, that the cause of idiosyncrasies is the peculiar structure, and consequent irritability, sensibility, and faculty of thinking of the body of individuals, so various as not to be susceptible of any regular classification, but still so remarkable as to constitute one of the most powerful heads of the predisposing causes of disease. It is accordingly to this head that we must refer that predisposition to certain diseases, such as primary calculi in general, tubercles of various organs, commonly called scrophula, gout, ichthyosis, and some other diseases of the skin; and, among the functional diseases, asthma, hæmeralopia, insanity, idiotism, &c. &c., so frequently communicated by parents to their offspring, as to have gained for the diseases in question the appellation of hereditary, though it is most obvious that it is not the disease, but the predisposition to it, which is entitled to the appellation.

The next subject of consideration as a predisposing cause of disease, after age, sex, temperament, and idiosyncrasy, is *habit of body*, which signifies its particular condition, more or less permanent, with respect to general strength and weakness, whether of the whole body or of particular organs; with respect to plethora, or abundance of blood, and the reverse; and

with respect to general obesity and emaciation, and so forth; conditions which depend in some measure upon influence of climate and season, the diet and kind of life to which individuals are more or less exposed, though it is not the climate, diet, &c. (as is sometimes supposed), but the habit of body resulting from them, which is the predisposing cause. Thus, in hot climates, and during the summer, the body is for the most part debilitated, pale, and spare, and the chief seats of disease are the liver and skin; while in cold climates, and during the winter, the body is for the most part robust, plethoric, and fat, but the lungs and kidneys are particularly liable to disease. This tendency to morbid affection of the liver and skin in the former case, and of the lungs and kidneys in the latter, may be easily explained, if we keep in mind what has been already said of the vicarious nature of the liver and lungs on the one hand, and of the skin and kidneys on the other. The secretion of bile is always in the inverse ratio of that of carbonic acid, and the secretion of the halitus from the skin, of that of the urine, and *vice versa*, so that consequently the liver and skin are as it were *imposed upon* in a hot climate, and the lungs and kidneys in a cold one. The equilibrium of the functions is maintained only in temperate climates; and the tendency to disease in the different organs under opposite circumstances will of course correspond to the additional work which each has to perform. Thus, in warm climates, and in summer, the habit of body is such as to induce a tendency to hepatitis, jaundice, cholera, and other diseases of the liver, as well as to diseases of the skin in general, such as lepra and elephantiasis; and it is likewise par-

ticularly liable under these circumstances to gastro-enteritis, diarrhœa, dysentery, &c. &c. from the sympathy between the skin and intestinal canal, as well as to trismus, tetanus, and some other diseases, the origin of which is probably in some disorder of the latter. Under opposite circumstances, on the contrary, the habit of body is such as to be particularly exposed to cynanche trachealis, bronchitis, peripneumonia, and hæmoptysis, tubercles, and other diseases of the lungs, and to nephritis and urinary calculi in general, and other diseases of the kidneys. Fevers likewise in general, as, in hot climates and seasons they assume commonly a typhoid character, so, under opposite circumstances, they take generally a synochal character; and it is probably from the increased action of the heart in the latter case that ossification of this organ and of the arteries is so much more common in cold climates. Other diseases also more common in cold climates and in winter, are cynanche tonsillaris, scrophula in general, catarrh, rheumatism, and gout, sanguineous apoplexy, and angina pectoris; but these seem to arise not so much from any peculiar habit of body, as from the sudden alternations of temperature to which persons are under these circumstances exposed.

Hitherto we have spoken of the influence of climate in the production of diseases only on persons permanently resident in the same place; but it is sufficiently well known that this influence is in general much greater upon persons who remove suddenly from one climate to another. The inhabitants of a cold climate, on removing to a hot one, are infinitely more liable to the diseases of the latter than the natives; and the

same may be said of the liability of the inhabitant of a hot climate on removing to a cold one, and this is precisely what we should *a priori* expect. It was not to be expected, for instance, that the liver and skin, or the lungs and kidneys, should all of a sudden take on an additional duty, without betraying any symptoms of it, although, had they been gradually habituated to it, they would have done it without any inconvenience; in the same way as a person, unaccustomed to work of any kind, sinks under a less degree of it than another not only bears with impunity, but requires for his well-being. Gradually, however, the labour becomes easier and easier, till it is no longer irksome; and, for the same general reasons, the organs in question become habituated to their additional exertion, till at length they are no longer exhausted by it. This is what has been called acclimation; and the study of the subject of the gradual manner in which the proper balance of the functions is restored, in persons removing from one climate to another, is one of the most interesting in which a person liable to undergo or to witness the phenomena attending it can engage. What has been said of change of climate, may also be said of change of season; and it is on this account that diseases (in as far at least as a peculiar habit of body is instrumental in producing them) are more prevalent in spring and autumn than in summer and winter. In spring, for example, a man is in the state of one who has come from a cold climate to a hot one; and in autumn to one who has made an opposite change; and in both instances, until the balance of the functions is restored, will he be particularly liable to

the several diseases of summer and winter.* It is obvious, however, that as the change is neither so great nor so sudden as in the case before alluded to, the effect of this will be less remarkable.

In conclusion, we may remark, that, in spite of its fogs and vicissitudes, so fertile a subject for the misanthrope, Great Britain has been abundantly proved to be the most healthy country in the world.†

The influence of diet on the habit of body is too commonly alluded to, to require any particular illustration. The fact has been already insisted upon, that man, when habituated to it, thrives almost equally well on a moderate quantity of almost every variety of aliment; but it is unquestionable that every kind of diet, when immoderately used, brings with it its particular predisposition to disease. Thus, excess of food in general, and particularly of animal food and fermented liquors, induces a habit of body predisposed to all the diseases consequent on plethora, particu-

* [The maximum mortality is in spring, the minimum in summer or autumn; the mortality in winter and spring is twice as great as in summer or autumn. From 15 years old to 35, the influence of season is trifling, and it is particularly manifest in infancy and old age. (Bernoulli, op. cit. p. 222.)]—Editors.

† [The following table, from Bernoulli (op. cit. p. 210), who is considered to be very accurate, corroborates the observation in the text.

Mortality of different countries.

In Spain and Portugal,	1 in 40 die annually.
Italy, Greece, and Turkey,	1 in 30 —
Prussia,	1 in 34·39 —
Bohemia,	1 in 34·1 —
Switzerland,	1 in 39·8 —
Russia,	1 in 32· ? —
England,	about 1 in 43·7 —]

Editors.

larly to urinary calculi of lithic acid, the severer forms of acne, polysarcia, gout, sanguineous apoplexy, and angina pectoris, hepatitis, and diseases of the liver already alluded to and explained; while any deficiency of food of this character induces a habit of body predisposed to all the diseases of an opposite description. The rich are less frequently affected by epidemic fevers than the poor, but more frequently die of them. Good fare keeps off diseases, but increases their mortality when they take place. Still the general mortality is much greater among the poor than among the rich.* In France it is double; in Prague and Leyden considerably greater. With respect to the line of life, it is hardly necessary to remark, that early hours (when, as we have before observed, respiration, and consequently all the functions depending upon it, are most energetic), and those occupations which are carried on in the country, and in the open air, and are attended with exercise (some of the advantages of which have been also already mentioned), are more conducive to a vigorous constitution, than late hours, and such occupations as are conducted in cities and within doors, and are of a sedentary character; and hence agriculturists are for the most part a more healthy race than artisans. In almost the same degree however that the disorders of the former are more rare,

* [This remark applies more particularly to the children of the rich and poor. Caspar (Lebens-dauer, p. 185) found, that among 700 cases of death among the wealthy, 39 only were of children under 5 years old, whereas, out of 700 cases of death among the poor in Berlin, 240 were below that age; but as yet, according to Bernoulli, there are not data for determining the general comparative mortality of the rich and poor.]—EDITORS.

they are more violent than those of the latter, and accordingly it may be doubted whether the former so constantly as is supposed live longer than the latter.

It is true that the mortality of cities is greater than that of the country; thus,—

Great Britain,	60	London,	40
France,	40	Paris,	32
Austria,	28	Vienna,	22
Holland,	48	Amsterdam,	24

But there are some strong facts on the other side. Thus, the mortality of Berlin is not greater than that of Prussia in general; and that of Manchester, the second largest town in England, so far from being greater, is considerably less (not more than 1 in 74.)*

* [The comparative mortality of different professions, some requiring a residence in town, others in the country, may be learned from the following. (Taken from Bernoulli, op. cit.)

Out of 100 who died of a natural death,

Of clergy,	42 were above 70,		14 above 80 years old.	
— landed gentry,	40	—	14	—
— men in public offices, (*hoch beamten.*)	35	—	13	—
— merchants,	35	—	8	—
— military,	32	—	13	—
— artists,	28	—	7	—
— teachers,	27	—	8	—
— physicians,	24	—	6	—

Although the appearance of cotton-spinners, &c. is unhealthy, yet there is comparatively little disease among them. Of 837, whose average age was 32½, 621, or three fourths, were perfectly well.]—Editors.

In like manner, it is the most common of all possible whims, to represent studious persons as not only exposed to all sorts of disorders, but as very short lived. But the records of academies, as well remarked by Alibert, sufficiently demonstrate that there are few classes of men who live to a greater age than philosophers. Nor is it at all incompatible with this fact, that, as observed by Vogel, "their

In conclusion of the subject Habit of Body, it may be remarked, that such is the power possessed by man, during health, of adapting himself to any variety, not only of climate and season, but of diet, habit of life, and circumstances, that although something must undoubtedly be ascribed to these agents, still a great deal of what is commonly advanced on this subject, however well intended, is little better than cant, and the permanent effect commonly attributed to temperance, country air, exercise, and so forth, upon *a priori* reasoning, is perhaps considerably overrated. That some regard to salubrity of situation and free air, to the adaptation of our clothing to the weather, to temperance in diet, and to the regular return of sleep and exercise, is in general conducive to our well-being, is not to be denied; but still the good effects of these or any similar agents, in permanently changing the constitution, and rendering it less liable to disease, are very inconsiderable. To man, the creature of habit, it can hardly be affirmed that one state is more congenial than another. He alone of all animated nature is found in every climate and in every condition, from that of the most laborious penury, to that of the most luxurious ease, and feeding by turns upon every thing which comes in his way. Habit is his nature, and whatever may have been at first either deleteri-

faces are generally like triangles, their limbs of oaten straws, their hearts of butter, their stomachs as weak as blotting paper, and their body flaccid, feeble, and marrowless." It has been found lately, that the average age of 152 men of science and literature of France, taken at random, was 69 years; and of 20 literary ladies living in this country during last century, the average was 71½ years. (Quarterly Review, No. 99.)

ous or beneficial, becomes by use comparatively inert; and if he cannot by any care rise much above his nature, he does not in ordinary circumstances sink much below it.*

In reference to these remarks, they must be distinctly understood to be confined to the healthy body, and to the possibility of effecting by such systems of training any permanent change in the constitution, and must by no means be extended to cases of sick-

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* It is indeed highly amusing to notice the great attention with which some persons regard the veriest trifles in the care of themselves, and the hopes which they entertain of the vast advantages to be derived from strict constancy in some particular style of self-management. Thus, one man is perfectly persuaded he could not possibly exist anywhere except exactly where he happens to find himself; another, that he should certainly die in a month if he took more or less than two glasses of wine a-day; and a third, that precisely one hour and a half's daily exercise is just what he has occasion for; while a fourth religiously abstains (like Bouleau) from sitting near the fire, lest peradventure it should dry up his radical moisture. But, for all this, it is written, man is not made to last for ever; the very care to preserve health is not unfrequently, by increasing susceptibility, the indirect cause of disease. The more rigid has been the observance of regimen, the more certainly pernicious will be the slightest aberration from it; and one act of intemperance, or an accidental deviation from a settled plan, shall do more mischief to the man of rule, than repeated irregularities to the habitual rake, since what they gain in frequency they lose in force. To a similar extent is vain the attempt any one makes to improve his own constitution; as he resolutely recedes from one source of disease, he necessarily approaches another, and if he still be content to use all quietly, as "nature is a glutton in nothing," he will probably, like other moderate livers, have his day of sickness and sorrow in the world, and, when his time cometh, be called to leave it for another.

[The substance of this note has already appeared in Fletcher's Rudiments of Physiology; but as the subject is important, this the suitable place for it, and that work not perhaps in the hands of all the readers of this, we think it right to let it stand.]—Editors.

ness, and to the possibility of producing, by diet and regimen, the temporary change in which the return to health consists. The application of the hygiene will be spoken of in future, but what is here chiefly to be insisted upon is this, that a healthy man can live his day almost anywhere and anyhow, and that by no means, nor by any instruction, can he go much beyond it.

That plain household kind of understanding with which most men are gifted, is in most instances abundantly capable of prompting them to a proper management of themselves. Our most fixed habits have very seldom taken their origin from deliberate reasoning, but have arisen either before we were able to judge of their propriety, or may be traced to accident, to superstition, to old saws, and solitary examples; and what must have been the consequence if man could not have adapted himself to almost every thing, and if the extent of this faculty in him had not been in proportion to his powers of doing himself mischief? Like Dr Slop, who marvelled that so many generations could have been brought into the world before the invention of his crotchet and squirt, later philosophers may perhaps admire how mankind so long existed while their sage doctrines remained unknown. But nature cannot wait for philosophers. If she do not point out to man the best of all systems of regimen, she has implanted within him a power which makes that best to which he is most accustomed; and if she do not prevent him from being raised and depressed *for a time* by many circumstances, she effectually preserves him (by the levelling influence of the same power) from

undergoing any permanent alteration. Use is said to be second nature; but, as was formerly said of delivery in oratory, we apprehend that use is the first, the second, and the third consideration, in the habits of man, and that in all things "pliant nature is as custom forms her." It is this that makes every thing which would either retard our progress or urge us beyond our strength, alike subservient to keeping us in a steady course, by which all attempts of man to work miracles on himself, and render him unsusceptible of disease, must be for ever frustrated, and by means of which he has at all times existed, and does continue to exist, the same "poor, bare, forked animal" that he was originally created.

CHAP. II.

EXCITING CAUSES.

HEAT—COLD—SUPPRESSED SECRETIONS—CHANGES IN THE BLOOD—BUFFY COAT—ANCIENT OPINIONS ON EXCITING CAUSES—HUMORAL PATHOLOGY — IRRITABILITY — JOHN BROWN — CHEMICAL DOCTRINES.

We come now to speak of the principal exciting causes of disease, which, it must be remembered, operate in producing such diseases only in conjunction with the predisposing causes, and through the medium of the proximate. These exciting causes may be divided into common and accidental; the former include *caloric*, *light*, *electricity*, *air*, *aliment*, *sympathy*, *passion;* and the latter, *blows*, *wounds*, application of *poisons* to the skin, &c.

Sudden or great heat produces continued fever, epistaxis, sanguineous apoplexy, hæmoptysis, syncope, arachnitis, gastro-enteritis, hepatitis, eczema, miliary fever, and many other diseases; but a much more common exciting cause is a sudden deficiency of such external heat, so universally spoken of as a positive, rather than a negative, agent, under the name of *cold.* From this, particularly when combined with moisture (the effect of which is simply that of a good conductor of caloric), a great proportion of all the diseases incidental to humanity immediately arises. Of these

the most remarkable are, as well as continued fevers, among the simple inflammations, cynanche trachealis, bronchitis, peripneumonia, ophthalmia, otitis, cynanche tonsillaris, odontalgia, and rheumatism; among the increased natural secretions, diarrhœa and catarrh; among other consequences of inflammation, tubercles of the cervical glands, and other forms of scrophula; and among functional diseases, nervous apoplexy, spasmodic ischuria, trismus, tetanus, and many more. From a consideration of this statement with one made above, of the diseases incidental principally to the inhabitants of hot and cold climates, it will appear that some of each class may be immediately excited by heat, and others by cold; for example, hepatitis, diarrhœa, trismus, and tetanus (all diseases almost peculiar to hot climates), are immediately excited, the first by heat, and the three last by cold; and the same is the case with hæmoptysis, cynanche trachealis, bronchitis, peripneumonia, rheumatism, catarrh, and scrophula (all diseases rather of cold climates), the first of which however is immediately excited by heat, the three last by cold. These apparent inconsistencies however will vanish if we reflect that the primary effects of heat are similar to the secondary effects of cold, so that each may thus indirectly produce almost the same diseases as the other, although *that* is with propriety set down as their usual exciting cause, from which they appear most commonly to arise. In order to understand this subject fully, however, it will be necessary to enter a little in this place into the general consideration of these agents upon the body.

It may with great probability be presumed, as has been already remarked in speaking of irritability in

general, that every positive agent is primarily a stimulant, and that it is only the negative agents which can be considered as directly sedative. Now caloric is one of the most essential and constant stimuli to irritability in general. An excess of it therefore will produce an inordinate irritation; and as every inordinate irritation is followed by a proportionate exhaustion of irritable matter, and therefore of irritability, the subsequent irritation, even from the usual stimuli, will be less than usual, and will only slowly recover itself; hence inflammation, &c. This increased irritation is sometimes almost immediately succeeded by collapse, and that even during the continued application of the heat, as when the cheek is reddened from long sitting by the fire, and the hand blistered from being kept in contact with heated metal. In general, however, the collapse does not come on till after the removal of the heat. On the contrary, cold, which is nothing more than the absence of caloric, is a defect of the accustomed stimulus, and produces, therefore, in the first place, less than the usual irritation; and perhaps this is sometimes the beginning and the end of its action, as when the application of the cold is continued, and the disease (for example, a sore throat from exposure to a cold wind, or local rheumatism from sitting in a draught) immediate. In general, however, the primarily diminished irritation does not give rise to an inflammation, but merely gives rise, in conformity with laws already set forth, to an accumulation of irritable matter and irritability, the result of which is a subsequently greater than usual irritation from no more than the usual stimuli (still further increased, of course, if these be increased), which is in

its turn quickly followed, if not too intense, by a proportionate exhaustion.

Of the two conditions then necessary to produce a disease, cold may be said to operate in general by increasing the susceptibility, and heat always by increasing the stimulus; but the ultimate action of both is the same, disease resulting as much from an increase of one as of the other. It is thus that we must explain the origin of inflammation in general, which consists essentially in diminished action at one time from cold, at another from heat; the former operating equally at two removes, the latter always at one; and it is not difficult to adapt the same principles to the explanation of spasmodic and other functional diseases, including thus all those above specified as arising from these causes. The only reason that can be assigned for general causes, such as heat and cold, acting at one time on one organ, and at another time on another, is the greater predisposition, always in some degree present, in certain organs to be affected; no man at any time having all the organs of his body in a state of perfect equilibrium in this respect. It is commonly supposed that a part of the effect of cold in producing diseases of internal organs depends upon the diminution of the halitus from the skin; the impediment of any one of the secretions being commonly supposed, as has been before observed, to overload the blood with principles which it should have lost, which blood thus becomes an inordinate stimulus to the capillary arteries of other organs, commonly considered vicarious of the skin, and excites them to increased secretion in order to relieve it. It seems infinitely more probable, however, as has been remarked

when on the subject of vicarious secretions in general, that the suppression of the halitus from the skin, as well as of all other secretions, operates not in changing the character of the blood, but in the manner of sympathy. It has been already said, that all secretions are copious in proportion to the quantity of blood which the secreting arteries contain, and that the quantity of blood is in the inverse ratio of the irritation of which they are the seat. Accordingly, increased action of the capillary arteries tends to exclude a portion of the blood from them, and consequently to diminish their secretions; and we have thence a right to assume that, whenever these secretions are diminished, it is as the result of increased irritation of the arteries in question. But increased irritation in one part is one of the most common causes of a secondary irritation elsewhere; and it is accordingly in this manner in general that a suppression of the secretions in general, and the halitus of the skin in particular, may become a cause of catarrh, and of the other diseases commonly ascribed to it. This subject will be further illustrated as we proceed; but in the mean time it may be observed, that much greater importance is attached to this mode of action of cold than it deserves. With respect to the changes observable in the blood in any of the diseases just enumerated, as arising from heat or cold (and it is under the head of exciting, not of proximate causes of disease, if they are causes at all, that such changes of the blood, regarded as one of the ordinary stimuli of the body, must be enumerated), it is proper to observe in this place, that arachnitis, and all other inflammatory diseases, have this peculiarity, that the

blood drawn from the vessels is at first generally more liquid than common, but nevertheless generally forms, when separated, a harder and firmer clot, presenting at the top a cupped surface, which is covered with a layer of tough buff-coloured fibrine, and that the quantity of albumen contained in it (as proved by Trail* and Gendrin) is nearly doubled, particularly in acute rheumatism, and it is of a much redder colour than usual. In nervous apoplexy, on the contrary, as well as in most cases of sudden death from lightning, the blood does not separate, or even coagulate, at all; it seems to contain less than its ordinary quantity of albumen, and it is of a darker colour than the blood in general.† The buffy coat (which, by the way, is not peculiar to inflammatory diseases, but displays itself in some cases of vigorous health, and generally during pregnancy) is in general more remarkable if the blood has been drawn from a large aperture and received into a deep vessel, than under opposite circumstances; but the rationale of this appearance is still very problematical. That neither this, however, nor any other change of the blood, is an exciting cause of inflammation, is obvious from this, among many other considerations to be immediately mentioned, that heat, cold, and so forth, applied to a part, often produce inflammation of that part and no other; whereas, if the blood were first affected, as this is immediately diffused over the whole body, there could be no cause why it should excite inflammation in this part more than in any other. Further, if the blood were pri-

* Annals of Philosophy, March 1823.

† See note to p. 86.

marily affected, there is no apparent reason why not only the part to which the exciting cause was first applied, but some other individual parts, should be affected more than all the rest, since the blood is continually circulating through all. When speaking of the natural coagulation and separation of the blood, it was observed that all the causes commonly assigned for these phenomena, such as the contact of the air, heat, motion, or vitality, were very inadequate to explain them, and they were described as in all probability arising from the blood, when drawn from its vessels, having ceased to undergo those molecular changes to which, when circulating in these vessels, it was incessantly exposed, and which were incompatible with the display of the characteristic properties, and consequently with the existence in it of the supposed proximate principles, on which this coagulation depends. Now it is in the parenchyma alone that these molecular changes, consisting of a continual decomposition of all the ingredients of the blood to form fibrine, albumen, &c., and a recomposition of them in the radicles of the veins, are effected, and the capillary arteries in this parenchyma are the exclusive seat of inflammation. It seems reasonable to suppose, therefore, that the changes in question in the cases of ordinary inflammation are in these capillary arteries imperfectly effected;—in other words, that the ingredients of the blood going to form fibrine, albumen, and colouring matter, are imperfectly decomposed, and passing into the radicles of the veins, which are still recomposing out of the other elements of the blood, and the products of absorption, the usual quantity of the same ingredients, of course overload the

blood with these matters,—the first displaying itself in such blood upon its coagulation, in the greater firmness, cupped surface, and buffy colour of the clot, and the second in the greater viscidity and other characteristics of an abundance of albumen in the serum, and the last in the unusually light colour. The same explanation may perhaps be applied to the buffy coat in plethora, pregnancy, &c., there being very generally in the first of them, and always in the second, more or less inflammatory action going on. But how is it to be explained that in nervous apoplexy, and in some cases of sudden death, the blood undergoes a diametrically opposite change, having too little fibrine to effect its coagulation, and too little albumen to give viscidity to its serum, and too small a quantity of colouring matter to give it its natural colour? The converse of the preceding explanation may be applied to these facts, and each may thus tend to support the other. If an overloading of the capillary arteries (in which the blood is naturally decomposed) tends to produce an abundance of these principles, an overloading of the radicles of the veins (in which the blood is naturally recomposed) might be supposed *a priori*, by preventing absorption, calculated to produce a deficiency of them. Now such an overloading or congestion of the venous system always takes place in cases of sudden death, owing to the suddenly impeded action of the lungs, while that of the heart is undiminished, by which blood is always accumulated in the veins. It appears therefore a simple and beautiful view of the matter to refer all superabundance of the principles to inflammation, all deficiency of them to congestion; and we may be satisfied that, except

when the preternatural coagulation or alteration of the blood is produced directly by chemical agents thrown into it, this explanation is applicable.*

By the earlier pathologists (to whom allusion will presently be more particularly made), and whose notions, it is to be regretted, some show a disposition to revive, the buffy coat in the blood was commonly ascribed to some morbid matter with which it was

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* [This view of the subject is supported by the recent observations of Andral, which will be found in the note to p. 86.]—EDITORS.

It is a singular fact, and one which seems strongly to corroborate the doctrine above inculcated, that a section of the nervus vagus in each side of the neck has always the effect, not only of coagulating, but of producing a buffy coat, in all the blood in the pulmonary system, while it renders all the blood that is in the rest of the body unsusceptible of coagulation. (See Dupuy, Mayer.) The effect of this division of the nerves is to produce distention of the capillary pulmonary arteries (really veins) (*i. e.* inflammation), from the difficulty with which the composing veins receive the unchanged blood, and at the same time congestion of the whole system of the vena cava, from the impediment to the flow of venous blood which in all cases attends suddenly impeded respiration. Now the overloading of the pulmonary capillaries prevents not only the perfect, but any decomposition, of the ingredients going to form the fibrine, albumen, &c. of the blood in their branches; and this, added to the quantity still naturally recomposed in the radicles of the pulmonary veins, produces such an accumulation of the principles, as at once to give rise to the coagulation of a great proportion of the blood in these, while the rest, which is carried into the system of the aorta, not only contrives to begin with a very small proportion of such ingredients, but even this is diminished by the overloading of the radicles of the vena cava, which prevents a recomposition of that which is as usual decomposed by the capillary arteries.

[Mayer's statement has not been corroborated by other observers; indeed the observations of Müller, and Professor John Reid of St Andrews, are decidedly opposed to this conclusion. See Müller, Physiol. and Dr J. Reid's paper in Edin. Med. and Phys. Journal, vol. li.]—EDITORS.

supposed to become impregnated; and regarding it thus as rather the cause than the effect of the disease in which it displayed itself, they were accustomed to order blood-letting again and again, as long as the blood presented this appearance.

With the decay of that system of pathology upon which this notion was founded, this explanation of the buffy coat in inflammatory diseases fell to the ground; and the most common rationale of it subsequently given, and still not uncommonly adhered to, was, that it arose from the slower coagulation of the blood under these circumstances, so that time being allowed during the formation of the clot, for the subsidence of the red particles, as the heaviest part of the blood, the upper stratum of the clot was of course left colourless. It is unfortunate, however, for this explanation, that the blood drawn in inflammatory diseases frequently coagulates, instead of more slowly, more rapidly, than in health (Coindet, J. Davy, Babington); and this explanation is farther inconsistent with the fact, that inflammatory blood, if drawn along a flat surface, displays the buffy coat, not at the top, but at the sides (Alison), as well as of the perfect line of demarcation, which is always apparent, between this coat and the rest of the clot.*

* ["We see," says Gendrin (Histoire Anat. des Inflam. t. ii. p. 439), from the experiments of the authors we have quoted [Ratier, Belhomme, and Récamier], as well as from our own, that it is impossible to consider the buffy coat, and the other inflammatory changes of the blood, as dependent solely either upon the character of the receiving vessel, the aperture of the vein, or the jet of blood, as these circumstances can only produce certain modifications, but can never make it appear when the blood is incapable of producing it."]—Editors.

But whatever notion we adopt with respect to the nature of the buffy coat and other characteristics of inflammatory blood, it can hardly be doubted that they are the effect rather than the cause of the diseases in question, and therefore that its consideration need not occupy us any longer here.

Of the other diseases above enumerated, the only one in which the blood has been represented in the light of an exciting cause is scrophula, which has been described sometimes as arising from a preternaturally acid, and at others from a preternaturally albuminous state of this fluid. These hypotheses, quite unsupported as they are either by proof or probability, are unworthy of any serious consideration. Their futility, however, will be best displayed in future, when some other diseases, with equal absurdity referred to some affection of the blood, will fall to be treated of.

Before proceeding to the other exciting causes of disease, it seems proper to mention a few of the most remarkable opinions entertained respecting their mode of action in general, and the steps by which we have progressively arrived at the explanation at present commonly adopted on the subject. The earliest opinion with respect to the action of the exciting causes of disease was, that they operated in general by conveying into the body, with the aliment or otherwise, some morbific matter, in order to expel which, some one or other of the first principal humours flowed in preternatural quantity to the affected part; that as health consisted in a krasis or temperies, signifying a proper balance of these fluids, so disease consisted in an akrasia or intemperies, signifying a preternatural accu-

mulation, &c. in the several organs, of either blood, yellow bile, or the supposed black bile, or phlegm; and in this consisted the essence of the humoral pathology, or that of the dogmatic or rational physicians of ancient times, which is still frequently alluded to, and the vestiges of which are still recognisable in some of our most familiar expressions, as good or bad humour, good or bad temper, distempered, and so forth. After the establishment of the tissues, however, by Plato, Aristotle, and Galen, it began to be supposed that the exciting causes of diseases operated sometimes by merely changing these tissues with respect to their essential properties, or their condition as to dryness or moisture, coldness or heat, without effecting any change in the distribution of the fluids, and these two modes of action were all that were generally admitted. It is true, that previous to this time the pneumatic school had attempted to explain the exciting causes of disease by referring every thing to an obstruction of the aforesaid essential properties alone, without the tissues being at all affected; while the methodic school of physicians had attempted this explanation upon the principle of these exciting causes producing either a constricted or a relaxed temperament of the body, so that a supposed continual motion of the atoms of which it consisted was either too little or too great. But these schools had but few proselytes. By the Arabians, and their successors the earlier chemists, the exciting causes of disease were presumed in general to operate by producing a preternaturally acid or alkaline state of the blood, and this notion of some primary change in the blood being the radical source of all diseases

prevailed among physicians even at the time of Cullen, and is still almost universal with the vulgar. Hitherto the supposed vivifying principle of the body, the φυξις, ενορμων, πνευμα, was but little thought of, or, if thought of, was supposed to be instrumental in the production of diseases only or chiefly by regulating the motion of the fluids aforesaid, so that such diseases were represented as merely efforts of this principle to repel or expel some threatened injury; and neither by Van Helmont, who attributed every thing to his *archæus*, nor by Stahl, who did the same by his *anima*, was it at all suspected that it was *directly by means of these properties alone* (which, if they signify any thing, can signify only irritability) that the exciting causes of diseases took effect. The distinct establishment of the property of irritability, by Glisson and Baglivi, laid the foundation for the doctrine which Hoffman, the colleague of Stahl, was the first explicitly to promulgate, that the exciting causes of diseases operated, not by vitiating the fluids, but by disturbing the solids; and that all diseases therefore depended, not upon various affections of diseased fluids, but upon some disease of the microcosmic motions of the solids, and that they were therefore always to be referred to preternatural affections of the nervous system. The pathology of Hoffman was however everywhere adulterated with the chemical doctrines of the times, as that of Cullen, who otherwise so closely followed his footsteps, was with the metaphysical tenets of Van Helmont and Stahl with respect to the *αυτοκρατεια*, or *vis medicatrix naturæ*, which (professedly unwilling as he was to admit it) nevertheless occupied a conspicuous place in his system. It was not

till the time of John Brown, the vagabond and despised but talented John Brown, that both humorism and autocrateiaism were entirely exploded, and that the true influence of irritability, or excitability, as he called it, in giving effect to the exciting causes of disease, was pointed out. As life has been shewn to consist of certain phenomena resulting from the action of certain powers upon a certain susceptibility, the balance of which constituted health, so a loss of this balance was shewn for the first time to constitute disease, and that without the intervention of either any fancied loss of balance in the fluids, or any convenient "Deus in fabula" in the shape of *archæus* or *anima* in the solids, which had hitherto been in such constant requisition. "Health and disease," says John Brown, "are the same state, depending on the same cause, that is, excitement varying only in degree;" a sentence which should be indelibly impressed on the minds of pathologists, since it inculcates in a few words a principle to which all the simplicity and all the precision of modern pathology, as contrasted with the complicated and vague speculations of the ancients, is owing. It was John Brown who first shewed, upon these principles, how opposite causes were capable of producing the same effects, by proving that all positive agents on the body, as heat, were stimulants,—in other words, operated directly by preternaturally increasing this excitement, and producing consequently a proportionate collapse; whereas all negative agents, as cold, were sedatives, and, in other words, operated by diminishing the usual excitement, whence arose an accumulation of excitability, and subsequently increased excitement,

followed in like manner by proportionate collapse. Brown was wrong in considering his excitability as imparted to every man in a certain proportion at birth, and not rather continually renewed; he was wrong in making it in every part of the body of the same nature, and not everywhere different; and, above all, he was wrong in allowing his doctrine concerning asthenic diseases, including most cases of inflammation and fever, to lead to the most pernicious employment of general stimuli, to the neglect of blood-letting in practice; and these errors, added to the ungainly person and manners, and disreputable Paracelsian habits, of poor Brown, are too often held in remembrance only to be execrated, while the real merits of his theory are forgotten or undervalued. "The evil that men do lives after them: the good is oft interred with their bones. So hath it been with *Brown*." It is this theory which forms the foundation-stone, not only of those of Darwin and many others in this country, but also, modified by the addition of certain positive as well as negative sedatives, of Girtanner and Wickand in Germany, of Rassori and Tomassini in Italy, and even, as modified by the doctrines of Bordeu and Bichat, of Broussais and his extensive school in France. "The alteration," says M. Chaussier, almost in the words of Brown, "the alteration of the vital forces constitutes the genera and species of all diseases, of which all the differences consist essentially in the degree, the nature, and the seat of this alteration."

More lately, Dr Pring and others, who choose to call Brown's doctrine "a meteor, the light of which is beautiful, but evanescent," have chosen to represent the exciting causes of disease as operating in

effecting some changes in the properties of life, while others have endeavoured, at least partially, to renew the effete theory, that these causes operate by producing some primary change in the blood; but it is unnecessary to dwell particularly on the merits of systems so totally vague as these. Life has already been frequently represented as a nonentity, so that to talk of any change in the properties of life must be to talk nonsense; and of the existence of any primary change in the properties of the blood, as resulting from the exciting causes of disease, there is neither proof nor probability. Besides, it is not the blood, but the solids, that are the seat of disease; so that the blood, even if primarily affected, can be regarded only as the last link in the chain of exciting causes, and these causes must still operate upon the solids before they can produce their effect. Frequent occasions will present themselves as we proceed, of inculcating this fact, and consequently of diminishing very much the importance of the question so frequently agitated, whether many of the exciting causes of disease, such as the matter of contagion, poisons, and so forth, as well as many of the remedies employed in removing them, be, or be not, absorbed into the blood previously to their producing their effects. Whether absorbed or not (*and there is no question that they frequently are absorbed*), their action is still upon the irritable solids alone; and the only difference is, that when absorbed, the blood is made subservient to the diffusion of the exciting cause, of which it may be represented therefore as constituting a part; whereas, when not absorbed, the action of such exciting causes, if diffused at all, can be diffused only in the manner of

sympathy; and we do not despair of being able to prove, or at least to render it highly probable, that the latter is by far the most common manner in which their action is extended. This subject cannot be dismissed without alluding to a notion almost peculiar to our times, but which happily is in a fair way of dying a natural death among us, that the exciting causes of diseases operate in effecting some change in the supposed chemical principles, proximate or elementary, of the body, and thus produce their effect. It has been before observed, that the body has been supposed to depend for its proper relative quantities of oxygen, nitrogen, carbon, and hydrogen, upon a proper balance being preserved between the quantity of each taken with the aliment, and the action of the liver, lungs, kidneys, &c.—the natural *emunctories*,—each of its particular principle, and that certain organs are chiefly instrumental in separating these primary principles into certain secondary principles, as the spleen in manufacturing fibrine, the liver, albumen, and so forth; and it has been accordingly further conceived by some people, that either a superabundance or deficiency of certain of these principles (simple or compound) is the cause of many diseases. But if these doctrines are applicable at all—that is to say, if the living body were to be regarded at any time as a merely chemical compound—it must obviously be so, much more frequently than has been assumed, since the proportion of the said principles, if liable to be ever disturbed, could hardly by any possibility, under the slightest variation of circumstances, escape disturbance. But the living body is considered as a chemical compound, or rather as a compound of compounds, only as often

as it is convenient so to consider it, when the function of some particular organ, or rather of some particular disease, is involved in more than ordinary obscurity. Thus, in speaking of the uses of the spleen and liver, these doctrines are very commonly insisted on by partial theorists; and sometimes, when speaking of phthisis, which is ascertained to be too much, as sea-scurvy is to be too little, oxygen,—of spontaneous combustion, which is referred to too much hydrogen,—of morbus cæruleus, which is attributed to too much carbon,—and of some kinds of urinary calculi and gout, which are ascertained to depend on too much, as diabetes is on too little, nitrogen,—as well as occasionally in speaking of some inflammatory diseases, which are referred to too much, as some diseases of debility to too little, fibrine,—of scrophula, which is traced to too much albumen,—of the above-mentioned kind of gout and rickets, which, according to other writers, are referred to too much acid of one kind or other, as another kind of urinary calculi, diabetes, and sea-scurvy, exostosis, and hyperostosis, are to too much alkali; whereas, in speaking of the uses of all other organs, and of the nature of "all the other ills that flesh is heir to," it was to be altogether forgotten that there was such a thing as hydrogen, oxygen, carbon, or nitrogen, as fibrine and albumen, or as acids or alkalies, in existence. Against these doctrines it is hardly necessary arguing at length; but we cannot avoid noticing the total want of principle which some of them display, that of the origin of diabetes and exostosis, for example, each from a deficiency of phosphoric acid in the blood, seeing that these two diseases have not apparently the most remote connection with

each other. The doctrine of diabetes has, it seems, been the last resource of a physician who, by his own account, has been for years "weaving hypotheses to account for the phenomena of this disease;" and that with respect to exostosis originated, it appears, in the circumstance of its being directly opposed to rickets, which had been previously voted to arise from too great an abundance of the acid in question. We have already alluded to the absurd notion formerly entertained, that ossification in the natural state is quite analogous to petrifaction, or the deposition of tufa; the phosphate of lime being carried in the state of a soluble superphosphate, by the arterial blood in the former case, as the carbonate of lime is, in the state of a soluble supercarbonate, by the water in the latter; and the superfluous acid being in some way or other in both cases removed, the insoluble salt is left behind. How a deficiency of phosphoric acid was to produce diabetes, is not excessively clear; but nothing was more easy than to deduce rickets from any excess of this substance; for, supposing the superfluous acid to be too abundant to be all removed, it followed that the salt in bones would still remain a soluble one, and would consequently be dissolved as fast as deposited, by the halitus which constantly lubricated them. But while the physician just alluded to weaved his hypothesis with respect to diabetes, without once considering that there were at least twenty other diseases strictly analogous to this, which the precious web, when it at length issued from its loom, could not possibly be made to involve, it was quite forgotten, in the chemical cloud so ingeniously thrown over them with respect to rachitis, to inquire how far the de-

position of muscle or nerve, processes strictly analogous to ossification, corresponded with the formation of tufa, in being carried, in the state of superfibrine and superalbumen, to the part to be musclefied or nervified, and afterwards refined down to the requisite condition;—whether the said superphosphate of lime could, during the process of ossification, be detected in the arterial blood,—how, if there, it got there without having been secreted somewhere or other,—and if secreted anywhere, why not at once, as phosphate or superphosphate, in the bones themselves, without all this circuitous process; why, if the superphosphate of lime were ready made in the arterial blood, which goes everywhere, it should be deposited in some parts more than in others; and lastly, by what law it was that the absorbing vessels in health gathered up the superfluous acid, leaving the saturated salt behind them, which in rickets they refused to do. Here are at least half a dozen difficulties, the least of which is greater than that which the hypothesis in question was invented to explain; but it has nevertheless been frequently reiterated, and that with considerable confidence; persons who reason on isolated phenomena, and without steady principles, so readily mistaking the neat and the pretty not only for "le vraisemblable," but even for "le vrai." If, however, rickets arose from superfluity of phosphoric acid in the blood, it must necessarily follow that exostosis and hyperostosis would arise from a defect of it,—in other words, from an excess of lime,—and this doctrine has accordingly been frequently and with equal confidence propagated; but it has never, so far as we know, been presumed that the hypertrophy of a muscle or the tumour of a

nerve arises from a superfluity in the blood of fibrine or albumen, which, to be consistent, we should imagine to be the case. On the contrary, an excess of the former has been lately supposed instrumental to a very different result; a late profound nosologist marvelling very much why children, in whose blood, to use his own words, "neither fibrine, nor a chief constituent principle of it, azote, is particularly abundant, should be chiefly subject to cynanche trachealis, in which disease, as is well known, there is commonly a deposition of a fibrous membrane in the windpipe;" sagaciously adding, that this is "among the many curiosities which the prying eye of philosophy has yet to follow up." Something similar may be said with respect to the supposed excess of albumen in the blood; the luminous idea above alluded to, of some necessary although undiscernible connection between a superabundance of fibrine and the deposition of the croupy membrane, having been in all probability borrowed by the nosologist in question from an analogous idea of his early friend and fellow-labourer Dr Parr, who, as has been before observed, ascribed scrophula, meaning probably by this term, if he meant any thing definite (which is not often the case), a tendency to the deposition of tubercles, to a similar superabundance of albumen. Now, why, if an excess of lime produces an overgrowth of bone, an excess of fibrine or albumen should produce respectively, not an overgrowth of nerve or muscle, but in the former case a tubular membrane, and that only in the trachea, and in the latter a parcel of tubercles, and that chiefly in the conglobate glands (to say nothing of other manifest objections), remains unexplained. Numerous other tissues, natural as well

as preternatural, severally consist chiefly of fibrine and albumen, as well as the croupy membrane and tubercular matter, and they are deposited in numerous other places besides the trachea and conglobate glands. This is never thought of, however, by random theorists, who, while they follow, when it happens to suit their purpose, the loosest analogies in explaining the functions of a single organ, or the phenomena of a single disease, neglect, at the same time, the closest analogy between the organ or the disease, and many others, to which their explanation is quite inapplicable. When the prying eye of philosophy, then, finds itself otherwise disengaged, it will probably be better employed in endeavouring to discover what leads pathologists into these omissions and absurdities (which it will find to be an almost total neglect of the study of the theory of medicine as a connected whole), than in attempting to follow up speculations, when no person properly educated could have conceived that they existed. Lamentable that Piorry has lately proposed copious dilution of the blood as a means of obviating the croupy membrane in croup! While on this subject, we cannot avoid mentioning, in illustration of extensive views of some persons, when they apply themselves only now and then to physiology and pathology, that M. Ségalas has lately inferred that cows' milk, the praises of which in phthisis have descended to us almost unalloyed through Hippocrates, Aretæus, Celsus, Cælius, Dioscorides, Galen, and almost all the more modern authors on this disease,—M. Ségalas has lately inferred that cows' milk, in order to drink which in perfection in phthisis, the ancient Romans were accustomed to resort in shoals to Stibiæ, where a great many cows

were kept, reaping thus the advantage, not only of their milk, but of their society, and for the sake of which, Mr Read, not long ago, proposed stabling with the cows, as a remedy in this complaint,—M. Ségalas, we say, has inferred that cows' milk is a very improper beverage in phthisis; and why?—" your reason, Jack; your reason." Because cows—cows have been found—cows have been found liable, by M. Huzard, to tubercles in various parts of their body! By what process, or succession of processes, the tubercular matter in various organs of the cow should, in its own proper person, re-enter the blood of the animal, and by this blood be conveyed into the milk, and with this milk enter the blood of man, and by the blood be deposited in its turn in his organs, and among these organs principally in the lungs, the deponent sayeth not; but the idea is certainly too magnificent to be deserted on account of trifling difficulties of this kind, and ought to be certainly held *in terrorem*, not only over the heads of drinkers of milk, hitherto injudiciously coupled with honey as a thing most to be desired, but also of eaters of eggs, and indulgences in aliment in general which contain much albumen, heretofore falsely considered as one of the most inoffensive of substances. It is to a similar lack of sound principles in theory on medical subjects, and a similar abuse of chemistry, that we must attribute the still prevalent notion about putrid and putrescent diseases, as signifying, not those in which the secreted fluids have a remarkable tendency to putrefaction (which no doubt sometimes happens), but those in which the blood and living tissues have such a tendency, which might *a priori* have been presumed never to occur, at least in the common alleged

instances of experiment. Nevertheless we find the nosologist above alluded to confidently stating, that in malignant fever, sea-scurvy, &c., such is certainly the case; and that in skin diseases "every thing concurs in evincing the existence of morbid and specific poison acting the parts of animal ferments;" and it was probably as actuated by this principle, or rather by this total want of principle of any kind, that he explains the beneficial action of the affusion of cold water in fever, upon this presumption, that the water is thus decomposed, and that the oxygen entering the body and taking to itself all the hydrogen, which is at liberty, leaves some to combine with the nitrogen, and thus to generate ammonia, the necessary attendant on putrefactive fermentation.

CHAP. III.

LIGHT—ELECTRICITY—AIR.

ATMOSPHERIC PRESSURE—VAPOURS—GASES—MIASMS—CONTAGION —[NATURE OF MIASMS—HENLE'S THEORY—LIEBIG'S THEORY]— MODE OF ACTION OF MIASMS—ABSORPTION OF MIASMS—INOCULATION—[CHANGES OF THE BLOOD IN DISEASE].

Heat and cold have hitherto been spoken of as exciting causes of disease: some of the more frequent of the others now come to be considered.

The only diseases said to arise from too vivid *light*, are ophthalmia, hæmeralopia, and amaurosis. In the first of these instances, the inordinate irritation of the membrane on which the retina is expanded, is communicated by sympathy to the external coats of the eye, and sometimes even to the nostrils, producing sneezing, which not unfrequently arises from looking at the sun. In the two last, the irritation is so great as, during its subsequent conveyance by the optic nerve, preparatory to producing sensation, to produce in it a state of collapse, analogous to palsy. Hence blacksmiths, glass-blowers, &c. are particularly liable to all these diseases.*

* [Goitre has been supposed to be partly produced by the obscurity of the places where it occurred, for it has been observed by Yoikocke, that it appears chiefly on the shady side of the long valleys of the Alps, where clouds and mists abound, and was very seldom met with in parts exposed to the sun's light. (Schönlein's Pathol. vol. i. p. 97.]—EDITORS.

ELECTRICITY.

There are but few diseases also commonly referred to electricity. The chief of these are, besides hæmeralopia and amaurosis (which probably arise rather from the intense light which accompanies it), local palsies* of the tongue, and nervous apoplexy; its effects as a stimulus being sometimes so intense as to do primarily what intense cold does secondarily, and thus instantaneously to consume not only all the sensible, but also all the irritable matter of the body, and consequently to leave it deprived at once of irritability and sensibility. Such is the case when it produces nervous apoplexy, in which not only all sensation, thought, and voluntary motion, are instantaneously suspended, but the muscles are quite unaffected by the application of even the strongest external stimuli; and the same effects result, only in a minor degree, when electricity is the exciting cause of the other diseases above mentioned.

AIR.

Under the head of air, as an exciting cause of disease, may be enumerated, exclusive of its temperature and degree of moisture† (which belong rather to the

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* [Ristelhueber (Jour. de la Soc. de Science de Bas Rhin. No. 184) mentions a case where three soldiers were struck with lightning. First paralysis of the under extremities occurred; subsequently they all suffered from gravel.]—EDITORS.

† [The degree of moisture, however, may in some cases have a specific power quite independent of its connection with the temperature, and become the cause of disease. Thus, according to Edward

head of heat and cold), all the variations in the density of the atmosphere, and all the impregnations of it with foreign matter, either simply offensive, as bad odours, or otherwise deleterious, as poisonous fumes, noxious gases, miasms, smoke, and dust.

The mean pressure of the atmosphere on the surface of the human body, supposing it to be about 15 square feet in extent, is about 40,000 lbs.; and the difference of pressure at different times, supposing the range of the barometer to be about three inches, as is the case in this country (though it is much less considerable in tropical regions), amounts to about 4000 lbs. It was reasonable to imagine that this immense difference cannot take place, as it sometimes does very suddenly, without producing a very sensible effect upon the functions of the body; and it is common to refer to the greater density of the atmosphere the otherwise unaccountable alacrity of body and energy of mind which we generally experience on a cold clear day, and to its greater rarity the equally unaccountable listlessness and depression so commonly felt upon a close hot day. It appears very questionable, however, whether what is commonly attributed to increased and diminished density of the atmosphere, should not be ascribed rather to the less and greater degree of heat of which that increased or diminished density are merely concomitants. It is sufficiently well known that no increase of alacrity is felt in a diving-bell in great depths

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(de l'Influence des Agens Phys.), when the moisture reaches its maximum, transpiration is at its minimum; and a moist atmosphere, by suppressing transpiration, inclines to dropsy.]—EDITORS.

under the water, where the density of the air may be presumed to be at its maximum. On the contrary, a great increase of alacrity is experienced on ascending in an air-balloon, or in elevated situations, where the pressure of the atmosphere is the least; an ascent of even 500 feet, it is computed, producing a diminution of pressure of about 600 pounds. In these latter cases, then, we have no difficulty in referring the peculiar state of both body and mind to the cold experienced by persons in these situations; but as cold at the ordinary elevation is accompanied by an increase, not a diminution, of the density of the atmosphere, we commonly ascribe to this increase of density what is really attributable to the cold; and the same doctrine may be applied to the opposite state of the body, commonly referred to diminished density of the atmosphere, but really referrible to the heat which accompanies it. However this may be, it is not easy to attribute the occurrence of any particular diseases to the difference in the density of the atmosphere alone, unless perhaps hæmoptysis, asthma, and some other diseases of the lungs, owing to the greater or less expansion which the same quantity of air undergoes in this organ in proportion to its greater or less density, and the consequently unequal stimulus with which it acts upon it. In some aquatic animals the influence of increased pressure in producing hæmorrhage is very remarkable. Whales, for instance, when harpooned, and diving in consequence to immense depths, upon rising again to the surface, have been found to spout blood from almost every outlet of the body. This effect is not wonderful when we recollect that for every 32 feet of depth the pressure of the water upon the body

of the animal, and consequently upon the blood-vessels, is doubled; so that an increase of pressure is thus experienced by aquatic animals at great depths, from which terrestrial animals are altogether exempt (and the blood, as is supposed, is squeezed from its vessels like water from a sponge). This is perhaps too mechanical. (See Hæmorrhage.) Of the foreign matters diffused through the atmosphere, it is probable that peculiar odours, and even the effluvia arising from the putrefaction of animal or the decay of vegetable matters, provided they be not so strong as to occasion asphyxia, whether aromatic, as roses, pinks, honeysuckle, &c. or fœtid, as those of privies, do harm in general only in proportion to the disgust which they occasion, and that their apparent effects, therefore, in exciting diseases, are properly to be classed with those of the passions.

From the earliest periods it has been a prevalent opinion, that the gases resulting from putrefaction were a fertile source of all manner of diseases; and accordingly there is no end to the accounts of epidemics traced by authors, not only ancient, but modern, as Parè, Diemerbroek, Pringle, Angillacci, &c. to this cause. The truth of this opinion seems to have been questioned first by Van Swieten, and its falsity has been almost established by the observations successively of Ruysch, Chisholm, Barncroft, Ferguson, Ozanam, and many others. Nor do the experiments of Chaussier, Nysten, and Magendie, who found that animals could not exist above a certain number of days when confined in very putrid air, tend at all to invalidate this opinion, since it may be easily conceived, on the one hand, that the disgust naturally ex-

cited by putrid odour in these instances had not been overcome, so that they operated perhaps through the medium of the passions; or, on the other hand, that the quantity of these gases was such as to exclude atmospheric air to a degree incompatible with the process of respiration.*

Of the really poisonous vapours with which the atmosphere may become impregnated, the principal are those which arise from certain vegetables, as tobacco, deadly nightshade, henbane, hemlock, opium, poppy, digitalis, and so forth, as well as from certain metals, as lead and mercury. The deleterious effects of these vapours have been known from the earliest times; but as the diseases produced by them, acting, as they may be supposed to do in general, on the mucous membrane and the skin, are almost entirely the same as

* [Among the other evidence against the alleged power of putrefying animal matters to cause fever, is the fact that occurred in Paris in the year 1780, when the churchyard of St Innocents was ordered to be lowered. This burial-ground had become elevated several feet above the surrounding surface, by the quantity of dead bodies that were interred in it. The usual mode of burial was to throw them into pits capable of containing 1200 to 1500, and it had become an insufferable nuisance to the inhabitants of the district. Although a considerable part of this operation was performed in summer, and latterly without any precautions, yet neither the workmen employed, except when thrown down by the sudden emanation from an exposed corpse, nor the inhabitants in the neighbourhood, became affected with any febrile disease. "There are many other similar exhumations of minor extent that have been carried on with like immunity; and these facts, together with the general exemption of butchers, sugar-bakers, tanners, &c. &c. &c., distinctly show that the putrefaction of dead animal matter, though it may predispose to typhous fever, is not the active poisonous agent in producing it."—(Elements of Practical Med. Williams, vol. i. p. 31.)]—EDITORS.

when received into the stomach, their action in producing those diseases will be mentioned in future.

Besides bad odours and poisonous vapours, the atmosphere is liable to be impregnated with certain deleterious gases. Of these, some, as chlorine, hydrochloric acid, sulphurous and nitrous acids, are considered acrid; others, as nitrogen, hydrogen, and the protoxide of nitrogen, narcotic; others, as the carbonic oxide, carbonic acid, and carbonated hydrogen, narcotico-acrid; others, as hydrosulphuric acid, septic; and others, lastly, as ammonia, corrosive; and there is no doubt that some peculiar diseases are excited by each when inhaled in a diluted state. Into this, however, it is not necessary to enter in this place. It is extremely probable that the principal deleterious effects of all of them, at least when concentrated, is in producing asphyxia. This they do by excluding from the lungs atmospheric air, the only material calculated permanently to support respiration, although in one respect they differ from each other; some of them, as those reputed acrid, septic, and corrosive (perhaps like concentrated bad odours and putrid effluvia in general), acting apparently by stimulating so strongly the arytenoid muscles as to induce a spasmodic constriction of the glottis, by which they are excluded, while others, as those reputed narcotic, enter the lungs; and of those reputed narcotico-acrid, some, as carbonic acid, are excluded in the same manner as the acrid, septic, and corrosive gases, while others, as the carbonic oxide, and perhaps carbonated hydrogen, enter the lungs in the same manner as the narcotic.

It is remarkable that the protoxide of nitrogen, pre-

viously to occasioning asphyxia, commonly gives rise to a kind of delirium, attended with very pleasing sensations, and an incontrollable propensity to laughter. The cause of this is unquestionably a specific irritation excited in the lungs by this peculiar stimulus, which is conveyed to the brain in the manner of sympathy; in the same way as ordinary intoxication is to be ascribed to a specific irritation excited in the stomach by spirituous liquors, and conveyed to the brain in a similar manner. Another species of impregnation which the atmosphere occasionally undergoes is from various kinds of smoke and dust, which may not only occasion ophthalmia as directly applied to the eyes, but, entering the lungs with the inspired air, may, by occasioning bronchitis, lay the foundation of bronchial calculi, phthisis, &c.; and it is on this principle that the frequent occurrence of the last-mentioned complaint in certain artificers and other workmen, as needle-pointers (Johnstone), scythe-grinders, hair-dressers (Portal), masons (Wepfer), plasterers (Lieutaud), flax and feather-dressers, as well as coal-heavers, chimney-sweeps, millers, and others who are continually employed in air impregnated in this manner, is to be explained. The same substances, also, lodged in the crevices of the integuments, are supposed to give rise sometimes to inflammation, terminating in scirrhus, as that of the secretion so common in chimney-sweepers, from the lodging of the soot in the rugæ of the scrotum (Pott), and similar substances, as the small crystals of raw sugar, brick-dust, and so forth, when continually applied to the skin, as happens with grocers, bricklayers, and others, appear to give rise frequently to certain forms of

eczema and impetigo. Lastly, the impregnation of the atmosphere with impurities of this kind appears to be a frequent exciting cause of asthma, their operation in this way being very easily explained.

The last description of impregnation to which the atmosphere is liable, and unquestionably the most important of any, is that by miasms, or the pernicious gaseous secretions of animals and vegetables, of the existence of which we are apprised only by their dreadful effects, since neither the senses nor the most delicate chemical tests are capable of taking any cognizance of them. Of these miasms some appear to arise from the bodies of persons already diseased, and not from the dead, and to be immediately noxious only within a few feet of their source, though they may be conveyed by matter imbued with them (hence called fomites) to any distance; others appear to ascend more or less constantly, but particularly during the spring and autumn, from marshy grounds, and to be more extensively diffused, though their influence is still circumscribed; while others, lastly, are generated we know not how, and seem at intervals, without regard to climate, winds, or weather, to overspread whole districts and countries. The diseases arising from the first of them alone, or those emanating from the bodies of the sick, like the diseases communicated by actual contact, are properly called contagious, while those produced by the two last are properly distinguished by the name of infectious; and an endemic or epidemic disease may of course be of either description, and such a disease may arise occasionally from many other causes besides miasms. Under one or other of these two orders of diseases, contagious or infectious, are frequent-

ly arranged many fevers, typhus, the plague, yellow fever, and intermittent fever, malignant peripneumonia, and phthisis, peritonitis, dysentery, cholera, ophthalmia, cynanche parotidea, epidemic catarrh, influenza, rubeola, scarlatina, plica polonica, elephantiasis, guinea-worm, varicella, erysipelas, variola, hospital gangrene, and pertussis. But with respect to the question, which of these diseases should be regarded as contagious by means of miasms, and which infectious alone (if indeed they be all either the one or the other), there is no end to the diversity of opinions. The fairest view of the question seems to be, that the liability, not only of the above-mentioned diseases, but of diseases in general, to be communicated by contagion (that is to say, by miasms arising from the bodies of those already affected), varies only in degree from that of rubeola, scarlatina, varicella, and variola, which to all appearance arise *always* from this cause, not only from that of the rest of the diseases just enumerated, which to all appearance arise *sometimes* from this, sometimes from other causes, but also from that of the most insignificant of those diseases which, as to all appearance *never* arising from this cause, are in general quite excluded from the discussion.

Ignorant as we are of the miasms of contagion in any case, we appear to be quite unjustified in denying the probability of every disease arising from this cause; and certain as we are that some diseases do so, and that in all diseases the exhalations of the body are always more or less pernicious, we should pay more deference to one positive instance in favour of the opinion that any particular disease is contagious, than to

twenty negative instances in support of the opposite doctrine.*

With respect to the source, or rather the matter of infection, all is doubt and uncertainty. In the instances of diseases unquestionably contagious, such as

* It is improper to dismiss this subject without observing, that it has been lately asserted with great confidence, that the whole doctrine of the origin of diseases (at least of any of those diseases which can possibly arise from any other cause) from contagious miasms is erroneous, and that it originated with Fracastor about the middle of the sixteenth century, who, at the suggestion of Pope Paul the Third, propagated this doctrine for political reasons, with respect to a fever which had broken out at Trent during the celebrated council held in that place, which council the said pope was desirous of transferring to Bologna. Abundant evidence, however, exists that the origin of diseases in general from contagious miasms was well known to the most ancient authors. Distinct intimations of this are to be met with in numerous authors from the time of Sophocles down to the time of Fracastor aforesaid, although it is remarkable, that, with the exception of Aretæus, Cælius, Galen, and Paul of Ægina, who speak extremely shortly of it, no mention of contagion, properly so called, is to be met with in any of the Greek or Roman physicians whose especial business it appears to have been to investigate the causes of diseases, but who seem to have too closely followed Hippocrates in attributing almost every thing to climate, situation, season, and so forth. The first among physicians who insisted particularly upon contagious miasms as a cause of disease were the Arabians, by whom the first distinct accounts of rubeola, variola, and other diseases eminently contagious, were given; but the doctrine, after the decline of their supremacy, again lost ground, till it was revived about the fourteenth century, upon occasion of the prevalence of some remarkable epidemics; and it was about this time that certain statutes designed to prevent the propagation of diseases by this means began to be enforced at Venice, Milan, and other places. The subject was soon after taken up by Benedict, who was the first particularly to investigate the several circumstances under which contagion chiefly operated; the result of which was, that in 1495 the first regular quarantine laws were instituted at Venice, by which persons and goods coming from suspected places were sub-

rubeola or varicella, there can be no doubt that the contagious miasms are secretions from the diseased animal body; and the same may be presumed to be the case in all diseases which have been represented as communicated from one person to another. But with respect to diseases generally considered infectious, such as intermittent fevers, and perhaps also yellow fever, and some few more, the source of the deleterious matter has always been extremely doubtful: it is generally from marshes, and has been attributed to putrefying animal and vegetable substances. But

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jected for a certain time to a thorough ventilation. All this occurred before the time of Fracastor, who was therefore so far from having invented the doctrine, that he did no more than chime in with the universally prevalent notions of the day. The doctrine of contagion was propagated in this country first by Lord Bacon with respect to the celebrated jail fever in 1577, and it has been since his time almost universally inculcated by British authors. With respect to infectious miasms, it has never been questioned that these exist, and are a fertile source of numerous diseases. With these miasms indeed the ancient authors were much better acquainted than the modern, their ignorance of the art of draining and clearing lands having exposed them much more than we are exposed to their pernicious influence. Their acquaintance with these miasms was at first conveyed, like every thing else, in a mythological form; and intimations of this are sufficiently obvious in the fable related by Hesiod, of the Hydra, the offspring of Typhon and Echidna, which inhabited the Lernian Lake, whose several heads were cut off by Hercules; and in that related by Homer, of the boggy ground about the mouths of the Scamander and Simois, into which Apollo was represented to have shot his darts, and thus occasioned the pestilence which broke out at the siege of Troy. Similar notions, divested however of their mythological character, were propagated by almost all ancient authors; and indeed the frequent prevalence in ancient times of fevers of the remittent or intermittent character, in the Peloponnesus and Asia Minor, at Syracuse and at Rome, afforded them opportunities, from which we are at present happily exempt, of becoming acquainted with marsh miasms as a cause of disease.

salt marshes are as bad as fresh; and there is no more fertile source of such diseases than close damp woods and forests, where there is no putrefaction. Vegetables secrete like animals, and are liable by disease to have their secretions vitiated. Now diseased animal secretions produce contagious diseases; analogy, therefore, would lead us to suppose that those miasms from which infectious diseases arise, such as those of marshes, are in like manner secretions from diseased vegetables; and this opinion derives additional support from the fact, that we cannot imitate these miasms by any artificial process, any more than we can imitate any one of the healthy secretions of either animal or vegetable substances.

The state likewise in which vegetable substances exist in marshes, and close wet woods, is manifestly unhealthy, and similar probably to that in which the animal body exists when labouring under a contagious disease; and as the animal body, when dead, ceases to put forth these miasms as its other secretions become less virulent, a fact well known to dissectors, so the vegetable body, when dead, ceases to emit any noxious exhalations. We cannot ascertain, as has been said, either by the senses or by the most careful analysis, the nature of the miasms of either vegetables or animals. This fact seems to furnish another argument in favour of the analogy which has been supposed to exist in the mode of their generation and in their nature; and when it is considered that the most virulent and concentrated animal secretions known, viz. the poison of the viper, affords, upon analysis, almost precisely the same principles as those found in the most bland vegetable secretion, viz. gum-arabic,

it is reasonable to suppose that all attempts to ascertain the precise nature of miasms, either animal or vegetable, will for many years to come, that is, till the resources of chemistry are much more extensive than they now are, prove abortive. With respect to the effects of such miasms upon the senses, it is said by Bacon, that the contagious miasms of plague have an odour very similar to that of the convallaria magalis (lily of the valley), and by others, that those of yellow fever, dysentery, variola, and other diseases, have likewise each a very perceptible odour.

It is extremely doubtful, however, whether the odour in these cases be that of the peculiar miasm, or that of the innoxious secretion. In like manner, the miasms of contagion, and infection in general, have been represented by Van Helmont, Paracelsus, &c. as sometimes of a sulphurous nature, at other times of an arsenical, and at others alkaline, and so forth; and it was the fancy not long ago to describe them as consisting of hydrogen, of phosphuretted hydrogen, and carbonic acid, and nobody knows what besides; but of all these doctrines it is sufficient to say, that no known preparation of sulphur, arsensic, or alkalies, and certainly neither hydrogen, phosphuretted hydrogen, nor carbonic acid, are capable of producing effects at all similar to those resulting from the miasms in question, and that no chemical analysis has proved, or even rendered it probable, that they consisted of any of these substances. Such analyses have been attempted within these few years by Berard, Cavendish, and others; and an account of some of them is given by Robertson in his Natural History of the Atmosphere; but the results of their investigations were any thing

but satisfactory. Still more recently, Mr E. Davy has examined with every precaution the air taken from the wards of an hospital crowded with typhus-fever patients, and found it in its chemical nature, as far as this could be ascertained, as pure as that of the country. Julia Fontanell and Moscati have examined with the utmost care marsh miasms collected from the most pestilential districts, and that without detecting in them any principle to which their virulence could be ascribed. All this seems strongly to favour the doctrine which has been advocated above, that such contagious and infectious miasms consist of combinations of principles, to the production of which organized beings, animal or vegetable, alone are adequate; in other words, that they are animal and vegetable secretions, and that it is not to this or that individual principle, but to the peculiar combination of them all, which can be effected in no other way than by secretion, that their pernicious effects are to be ascribed.*

* [The attempt to explain, by the investigation of the essential nature of miasms themselves, the peculiarity of their operation on the living body, has been lately revived, and is now exciting so much interest as to require a short notice in this place.

The old doctrine of the "contagium animatum," revived in the last century by Kircher, somewhat sanctioned by Linnæus, through the Amœnitates Academicæ, more fully exposed by Nyander, and in more recent times supported by the investigations of Bassi and Andouin, Hanover, Schönlein, Langenback, and Holland, has been adopted and more fully developed by Professor Henle of Zürich, of whose researches we may here give a brief account.

The view taken of this subject by Henle is, that the miasmatic contagious diseases (corresponding to the purely contagious, and to those both contagious and infectious of Fletcher) depend for their existence and propagation on certain parasitical organized beings, or

With respect to the manner in which these matters, whether of contagion or infection, enter the body in

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their germs, whose presence and development in the body are the exciting cause of the symptoms which constitute these diseases.

The action of these parasites may be of two kinds, either such as to produce inflammation, or putrefactive decomposition. Of the latter, hospital gangrene is the only example given. Putrefaction, it is here observed, is not a mere chemical decomposition, but a change produced by infusoria, which are nourished at the expense of the organic matter, whose affinity is (in gangrene) so weakened as to enable this to take place. This process resembles fermentation, in which fungi, by assimilating a part of the fermenting substance, give rise to changes from which the products of fermentation result. This will be more fully considered presently, but in the mean time we shall pass on to,—

The miasmatic contagious diseases with inflammation of the skin.

The disease begins by the reception of the parasitic being, or its germ, which takes place only in mucous membranes, or at injured places of the skin. It is worthy of remark, that miasmatic contagious diseases of the mucous membranes are often observed without any diseases of the skin, but that all outward exanthemata are complicated with exanthemata of the mucous membrane, and that the latter are always the first to appear, except in cases of direct inoculation. In the latent stage the parasites remain either undeveloped, or have not reached a sufficient number to produce perceptible influence on the body: afterwards inflammation or putrefaction appears. The inflammation is in the form of the papulæ, vesiculæ, &c. of the exanthemata, or similar eruptions on the mucous membranes. The inflammation of the skin spreads in three ways. 1st, The parasites, multiplying rapidly, extend themselves over, or below, the surface of the skin; in the latter case, the outward skin becomes affected from the mucous membranes; and it is not unimportant to remark, that all acute exanthemata, which begin in the eyes, nose, or mouth, take their course from the head to the trunk, and often proceed no lower than the upper half of the body; while, on the other hand, in dysentery, which appears to act first on the lower part of the intestinal canal, the eruption, when it breaks out, first attacks the belly. 2d, By sympathetic irritation of parts of the skin not immediately infested by the parasites, as well as of other organs, such as the liver, kidneys, &c.; but this explanation by sympathy cannot apply

order to produce their effects, there are three principal opinions, viz. that they do so either by the lungs, the

to such diseases as smallpox, where every pustule in the skin contains contagious matter. 3d, The parasites may be absorbed into the blood, and deposited in other parts. It has already been shewn that there is no ground for supposing this to be a usual mode, or at all necessary to the course of the exanthemata; but the possibility of its occurrence in solitary instances cannot be denied. If the inflamed spots on serous membranes, which Petzholdt (Die Pockenkrankheiten mit besonderer Rücksicht auf pathologische Anatomie, Leipzig, 1836, p. 29) has described, are really pocks, and contain contagious matter, the latter could only have got there through the blood, as in the absorption of pus.

The cause of the fever in miasmatic diseases is, *first*, the local inflammation, and, *second*, the changes in the blood, or in the organic substances at whose expense the parasite lives. In this case the blood must be altered, like matter in which fermentation is going on. The second cause is the most essential, for the fever is more violent than in simple inflammation of the skin of an equal extent and severity. The fever, also, as a sign of the full working of the miasm, seems to be necessary to the complete protection of the body against subsequent attacks.

The disease goes on till the parasite ceases to grow or deposit its eggs, which are then discharged in the various excretions, as scabs, pus, desquamation, halitus, &c. The duration of a disease may perhaps be considered to correspond with the length of life of a generation, and that of an epidemic with that of a species.

This doctrine is supported by the following arguments.

1. "The capability of increasing themselves by assimilation of foreign matters is only to be found in living organized beings."

Although at first sight the process of fermentation might seem to contradict this dogma, since a small quantity of yeast excites a fermenting action in a large mass of sugar, and also reproduces itself, yet, since the researches of Cagniard Latour (L'Institut, Decembre 1837, and Compte Rendu, 1838, Juillet) and Schwann (Poggendorf, Annalen, 1837, bd. xli. p. 187) have proved, almost beyond the possibility of a doubt, that fermentation is the decomposition of an organic substance by vegetable beings of the lower fungus tribe, which increase at the expense of the organic matter, what appeared the most serious objection turns out the strongest support to the doc-

stomach, or the skin. The first is the most ancient conjecture, and is advocated accordingly by Lucretius:

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trine. The grains, also, of the form of a gourd-seed, which Leeuwenhoeck (Opera Omnia, L. Bal., 1722, t. iv. p. 2) discovered in vinegar, wine, and beer, are not crystals, as he thought, but parts of the *torula cerevisiæ*, a kind of fungus. Cagniard Latour followed the development of these grains from hour to hour during the brewing: they were at first simple, then on each appeared one or two sprouts, which gradually increased till they attained the size of the original grains; they then pushed out new sprouts from themselves. He also observed that the globules of yeast, during the working of the mash, contract and eject seeds, from which sprouts proceed, after they have reached the size of the parent grain. Thus, like the lower fungi, they have a double mode of propagation, by sprouts and seeds.

2. The action of contagious matters is analogous to fermentation in this respect also, that the amount of effect produced bears no proportion to the quantity of ferment employed. This depends on the power of self-increase possessed by the agent itself, as is shewn in putrefaction and fermentation, and may be adduced therefore as additional evidence in favour of the animated nature of contagious matters.

3. In support of this theory Henle mentions the fact, that the course of cholera and other epidemics is frequently wholly at variance with all the known meteorological laws, but is quite consistent with the idea of their propagation by means of organized beings.

This is the chief argument that Dr Holland makes use of in support of the hypothesis of insect life being the cause of contagious diseases. (Holland's Med., notes, p. 568.)

Another strong argument in support of this theory is the analogy between miasmatic diseases and a very singular epidemic disease to which the silk-worm is liable, called muscardine, and first described by Bassi. The silk-worm which is attacked with the disease scarcely affords any outward sign of it, except toward its termination, when it ceases to feed, and the surface becomes generally red, or reddish and yellow spots are diffused over it. The characteristic signs of the disease do not appear until after death, when the body is bedecked with a white powdery efflorescence, becomes dried up, and, as it were, mummified. This efflorescence is mould, the germs of which, being introduced into the body of the silk-worm, are nourished at its expense. The parasite does not appear externally till after it has caused the

it has been supported also, in recent times, by Fermelius, Sanctorius, and lately by Sir A. Cooper. The

death of the worm: it then flourishes until the body is entirely dried up, when it dies, and leaves a dry powder filled with germs, which are dispersed through the atmosphere by the slightest disturbance, and thus spread like a miasmatic contagious disease. The fungus has been named the Botrytis Bassiania, from the discoverer Bassi. Bassi believed the disease to be contagious, but Andouin proved it to arise independently of contagion, and therefore to be miasmatic.*

Somewhat analogous to this disease of the silk-worm is one to which frogs have been observed, in certain circumstances, to be liable. Dr Stilling of Cassel made many experiments on the effect of removing the spinal cord and dividing the nerves of frogs. He observed that after the lower part of the spinal cord was removed, the toes of the hind feet often assumed a whitish appearance, and fine filaments, resembling mould, of several lines in length, formed an efflorescence over the affected part. The disease was capable of being propagated by inoculation in salamanders, lizards, and unhealthy frogs; but frogs in health did not seem capable of being affected by it. (Müller's Archiv. 1841.)

Such are the arguments from reasoning and analogy in favour of this ingenious and beautiful hypothesis, but for which, as is candidly admitted by Henle, positive proofs are as yet almost entirely wanting. For although he has examined typhous subjects, variolous and vaccine matter, desquamated skin in scarlatina, and other skin diseases, yet hitherto he has not been able to find any of the known infusoria, or any plant of the torula cerevisiæ species.

Among the purely contagious diseases, the itch is now generally admitted to be caused by an insect—the acarus scabæi—and that this is really the contagious matter, and not an accidental parasite, is rendered probable, if not proved, by the following facts:—1st, Inoculation with the matter of itch pustules does not produce itch (Köhler, Med. Vereinsitzung, 1836, No. 9, p. 41). 2d, It is said that the itch can be cured by rubbing off the insect with brick-dust, or picking them

* For a fuller account of this extremely interesting subject, see Bassi, del Mal del Segno, calcinaccio o Muscardino, sec. ed. Milano, 1837 ; and Andouin, Recherches anatomiques et physiologiques sur la Maladie contagieuse qui attaque les Vers à Soie, &c. Annal. des Sciences Nat. t. viii. p. 229.

second was likewise an ancient notion, and has been advocated recently by Lynd, Darwin, and Jackson.

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off individually (this, however, rests upon very equivocal evidence). 3d, The itch cannot be communicated by the male, but only by the impregnated female. The male only excites a few vesicles, but no real itch (Hertwig in Gurlt and Hertwig's Magazine der Thierheilkunde, 1835, heft 2). As the propagation of the insect is unlimited the disease becomes general and chronic, and never heals of itself. The insect preying by night accounts for the disease being generally communicated at that time.

Syphilis. The microscopic animalcule discovered by Donné (Ricord, Maladies Vénér. p. 58) in the matter of chancre and inoculated syphilitic ulcers, called vibrio lineola, and those peculiar infusoria found in the pus of syphilitic vagnitis, and called trichomonas vaginalis, were supposed by him to be the contagious matter. But as other observers (Henle, op. cit. s. 68, and Gluge, Anatomische Microscop. Utersuch. 1838, s. 23) have not found the former (the vibrio) in clean-kept chancres, and as it is an admitted fact that they are met with in almost all cases where pus is allowed to stagnate, whereas they are absent in buboes and chancres, from which Ricord produced a syphilitic ulcer by inoculation, it cannot be looked on even as diagnostic of syphilis, and much less can it be considered the matter of contagion. As to the latter, the trichomonas vaginalis, since it is frequently wanting in syphilitic ulcers of men, and is found in non-syphilitic discharges from the vagina of females, it has still less claim to be considered the contagious material. In the contagious porrigo Schönlein has discovered a fungus (Müller, Archiv. 1839, heft 1, p. 82), but it has not been identified by any means with the contagious matter.

In hydrophobia, Henle considers the contagion to be a parasite of the blood, since the inoculated part heals completely, and excision, unless immediately performed, is of no service. He is also inclined to believe that the uncertain and often extraordinary length of the latent stage (from 19 to 50 days, according to Hertwig's experiments) depends on the gradual multiplying of the parasite, until such a quantity is accumulated in the blood as to affect the system at large. The blood of hydrophobic animals being infectious is in favour of this view.

The very interesting and philosophical character of the investigation of Henle, and the fairness with which he states, and ingenuity

The third opinion seems to have originated with Fracastor, and has had but few advocates since his time.

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with which he supports, his hypothesis, have led us to give a more detailed account of the theory than any substantial basis on which it rests might seem to warrant. Many objections, such as the difficulty of explaining crises and metastases, the latent stage, and the effect of inoculation in shortening it, the explanation of which must be sought in the living body itself, not in the miasm, are so obvious that it is unnecessary to enter into a consideration of them. Instead of any commentary on Henle's theory, it may be useful and interesting to contrast it with the equally ingenious and diametrically opposed theory lately proposed by Professor Liebig.

Professor Liebig (Organic Chemistry, in its application to Agriculture and Physiology, 1840) has attempted to explain the action of miasms on purely chemical principles; and here, as in the above theory, the presumed analogy of the action of miasms to that of yeast in causing fermentation is the point on which the explanation rests. Yeast is described simply as an organic compound, undergoing the process of putrefaction or decomposition; and when this is placed in contact with a solution of sugar, it induces in it a similar decomposition or fermentation, not by any direct chemical or other action which it exerts on it, but by its catalytic influence alone. (Catalysis, the reader may be reminded, is that influence which a body in the act of combination or decomposition exercises on another body in contact with it, without itself in any way chemically combining with it. For example, platinum is not acted on by nitric acid, but an alloy of platinum and silver is completely dissolved; here the atoms of silver decomposing the nitric acid, seem to dispose those of the platinum in contact with them to do the same.) If this is the true explanation of the action of yeast, then it follows that other bodies in a state of decomposition should likewise have the power of exciting fermentation, which is found to be the case. For "muscle, urine, isinglass, ozmazome, albumen, cheese, gliadine, gluten, legumen, and blood, when in a state of putrefaction, have all the power of producing putrefaction or fermentation in a solution of sugar."—(P. 254.) As the action of the yeast depends solely on its presence as a body in a state of decomposition, it follows also that its quantity is abstractedly of no importance. The reproduction of yeast, which is one of the strongest arguments for its organized nature, he explains likewise on chemical principles, in the following manner;—" The conversion

With respect to the skin, its nerves are very little exposed, its surface comparatively very limited, and

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of gluten into yeast [which is previously described as oxidized gluten in a state of further transformation] in these vegetable juices is dependent on the decomposition (fermentation) of sugar; for when the sugar has completely disappeared, any gluten which may still remain in the liquid does not suffer change from contact with the newly deposited yeast, but retains all the characters of gluten. Yeast is a product of the decomposition of gluten; but it passes into a second stage of decomposition when in contact with water. On account of its being in this state of further change, yeast excites fermentation in a fresh solution of sugar; and if this second saccharine fluid should contain gluten (should it be *wort*, for example), yeast is again generated in consequence of the transposition of the elements of the sugar exciting a similar change in the gluten. After this explanation, the idea that yeast reproduces itself as seeds reproduce seeds, cannot for a moment be entertained."—(P. 345.) The action of yeast being thus explained on chemical principles, he next applies the same mode of explanation to the action of morbid poisons on the animal economy.

The action of putrid substances applied to wounds, or injected into the blood, is referred to their state of putrefaction exciting a similar decomposition in that fluid, just as yeast causes the fermentation of sugar. This he conceives to be most strikingly exemplified in the poisonous effects of bad Würtemberg sausages, which, when used as food, cause a gradual wasting of all the muscular parts of the body, and finally death: here it is supposed that the stomach is not capable of arresting the decomposition of the putrefying matters, which, entering the blood in some way or other while still possessing their whole power, impart their peculiar action to the constituents of that fluid. "All the substances in the body capable of putrefaction are gradually decomposed during the course of the disease, and after death nothing remains except the fat, tendons, bones, and a few other substances incapable of putrefying in the conditions afforded by the body."

"Experiments have been made for the purpose of ascertaining the presence of some matter in the sausages, to which their poisonous action could be ascribed, but no such matter has been detected. Boiling water and alcohol completely destroy the poisonous properties of the sausages, without acquiring similar properties." The

the renewal of air in contact with it, under ordinary circumstances, not frequent. With respect to the stomach, although its nerves are more exposed, its surface is still more confined, and the renewal of air within it still less frequent; but in the lungs we have

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same is observed of the morbid poisons generated in the living body. These poisons remain long unchanged in dry air, because decomposition is arrested; but they lose their properties in moist air, because their decomposition goes quickly to its completion. The temperature of boiling water and the contact of alcohol render them inert. Salts of mercury, sulphurous acid, chlorine, aromatics, volatile oils, &c. destroy their contagious properties. "Now this is the peculiar character of all substances which exert an action by virtue of their existing condition—of those bodies the elements of which are in the state of decomposition or transposition; a state which is destroyed by boiling water and alcohol, without the cause of the influence being imparted to those liquids, for a state of action or power cannot be preserved in a liquid." He then goes on to explain the action of non-contagious miasms, by comparing them to ferments introduced into fluids which do not afford the necessary conditions for their reproduction, as, for example, yeast introduced into a simple solution of sugar. Those morbid poisons that are reproduced, viz. the contagious miasms, are supposed to act on the blood in the same way as yeast acts on a mixed fluid containing sugar and gluten, as above explained. The reproduction of a miasm therefore depends, 1st, on the presence of that substance from which it was originally formed; 2d, upon the presence of a compound which is capable of being decomposed by contact with the exciting body."

Such are the chief grounds on which Professor Liebig rests his chemical theory of the action of miasms, and it must be confessed that, in many points, the analogy is very strong between the action of yeast and that of miasms, and the theory has at first sight a sufficiently plausible appearance; but a nearer examination will soon shew in how very many points it is deficient. It is quite unnecessary, however, to enter into consideration of these, since the question of the admission of chemical action, as explanatory of any of the phenomena of health or disease, has already been fully discussed in another part of this work.]—Editors.

all the advantages of exposed nerves, with an immense extent of surface, and incessantly renewed air; so that we can hardly question that this, in general at least, is the organ by which such miasms take effect on the body. Nothing need be said of the immense rapidity with which absorption is known to proceed in this organ, because we have no evidence whatever that such miasms ever require to be absorbed into the blood to produce their effect. Nay, it is not improbable that such an absorption, if it really took place, would rather diminish than increase their action.

This subject will be adverted to afterwards, but in the mean time we may observe, that the most rational opinion of their mode of action (like that of heat, cold, &c.) is, that they produce, in the parts exposed to them, merely an irritation of a certain character, which, being conveyed by sympathy to the organ on which chiefly they are to display their effects, excite there a secondary irritation, in which the disease consists. But of this hereafter.

It has been considered to favour the doctrine of the absorption of these miasms, and consequently of an impregnation by them of the blood, that some contagious diseases, such as rubeola, variola, and so forth, may be communicated by the mother to the fœtus in utero; but it is not less true that such diseases may be communicated by another person to the fœtus in utero, though the mother be unaffected; and as, in the latter instance, it must have been by the direct agency of the miasms that the effect was produced, so, in the former also, we seem justified in concluding that it was from the miasms or vitiated secretions of

the mother, and not from any vitiation of her blood, that the same effect resulted.*

It is remarkable that, after most of the diseases resulting from these causes, the individuals who have been affected enjoy a longer or shorter immunity from a subsequent attack. This is the case in some degree in all continued and remittent fevers, particularly the plague and yellow fever. Indeed the practice of inoculation in the plague has been adopted (however in-

* [There does not seem, as yet, to be sufficient evidence for the affection of the blood, either in measles or smallpox; all the experiments made on the former by inoculation being attended with many fallacies, and the evidence in favour of the latter being very inconclusive. There seems, however, more evidence in favour of the occasional impregnation of the blood in plague. Couzier filled a wound in a dog with blood of a plague-patient, and it died in three days. (Williams's Pract. Med., p. 297.) Clot Bey inoculated himself and two condemned criminals with the blood of plague-patients, and only one of them was in any way affected, and he had only a small bubo, which rapidly subsided without suppurating. He made experiments on dogs, and others of the lower animals, introducing blood from plague-patients into their systems, but all without effect.

The following experiments show that, in glanders, the blood is affected. Coleman transfused the blood from the carotid of a glandered horse into the jugular vein of an ass. The glanders affected the latter in a violent degree, and from that animal he produced, by inoculation, both glanders and farcy. Dieffenbach and Vibourg have also produced glanders by injecting into a sound horse the blood of a glandered one. (Burdach's Physiologie.) Dupuy and Leuret produced the malignant pustule of cattle by inoculation.

Dupuytren, Magendie, and Breschet have tried without success to communicate hydrophobia by the blood of rabid animals; Hertwig however (Beiträge sur nähern Kenntness der Wuthkrankeit, p. 156) succeeded in producing hydrophobia by inoculating with the blood of an animal affected with the disease. Transfusion of the blood of a mangy dog is said by Babington (Cycloped. of Anat. and Phys.) to have produced mange in another dog.]—EDITORS.

judiciously) upon this presumption; and that the yellow fever seldom or never affects an individual a second time, has been explicitly asserted by Fellows, Pym, and some others. This is manifestly erroneous, but such persons are for some time after the attack certainly less prone to it; and that the same thing occurs in typhus, is evident from the fact that persons ever recover from the disease in fever-hospitals, since, had they been equally liable to a subsequent attack, they must have taken the disease again and again during the period of their convalescence. In such cases, however, the immunity is only of a certain duration; but after some of the diseases above mentioned, as rubeola, scarlatina, varicella, variola, and pertussis, it continues in general as long as life lasts. The immunity in all these cases appears to arise from the diminution or loss of specific irritability of the tissues respectively affected, so that they are no longer acted upon in the same way by the same agents; and this appears to be in no degree more wonderful than the diminution or loss of the specific irritability known to occur in almost every organ with respect to most agents to which it has become accustomed, as in the example of the Schneiderian membrane with respect to snuff, and numerous others which will readily suggest themselves. In some cases, moreover, this destruction of the specific irritability of certain organs with respect to certain stimuli seems to be effected by exposing them, not only to these stimuli, but to others of a similar character; and it is in this way alone that we can explain the loss of the susceptibility of variola resulting from the vaccine inoculation, and of scarlatina from the use of belladonna. The period which the several kinds of

miasms require to produce their effects (that is to say, the period during which the state of excitement lasts previous to the supervention of the collapse) is, as well in different instances of the same disease, as in different diseases, extremely various. Some of them, as those producing yellow fever, cholera, and influenza, appear to have a tendency to operate almost instantaneously, while others, as those producing typhus fever, are accustomed to remain in the body weeks or months. The miasms also which give rise to variola seem to operate much more slowly than variolous matter introduced by inoculation; that is to say, the state of excitement which the former produces, is of much longer duration* than that produced by the latter; and it is probably upon this principle that we must explain the greater severity of the disease when produced by miasms than when produced by inoculation, since the degree of collapse will correspond with the degree of this excitement. If a pinch of snuff be received into the nostrils, the excitement which it occasions is short, the collapse and increased secretion are slight, and soon over; but if a similar pinch of the powder of asarum be received, the excitement lasts for some hours, during which we are not conscious of any effect, but the collapse and increased secretion which follow are proportionally severe, and of long duration; and it is a remark very frequently made with respect to common catarrh, that the sooner it displays itself after exposure to its exciting cause, the less violent it is, and the sooner it is over.

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* See note to p. 136, second paragraph.

With respect to the changes which the blood undergoes in any of the above-mentioned diseases, and of the propriety of regarding any of these changes (produced, as it has been supposed, by the immediate absorption into the blood of the miasm in question), as constituting any part of their exciting cause, it is sufficient to say that it is destitute both of proof and probability. For why, if so, are not all organs equally affected? and why, in this case, will not the blood communicate the disease to others? It is indeed abundantly well known, that in many of these diseases the blood becomes eventually more or less vitiated; that in the more severe cases of typhus fever, the plague, and other malignant diseases, it is more liquid than usual, and, like that in nervous apoplexy, does not coagulate in the usual manner; nay, that it often acquires a more or less poisonous property, and when injected into the veins of the lower animals, produces, not indeed the same disease, but still very deleterious and often fatal effects (Gendrin); still there is every reason to believe that these changes in the blood are rather the result of the diseases in question, than that they constitute any part of their exciting cause. It is hardly necessary to observe, that the notion of the blood in the living body undergoing any degree of putrefaction, as well as the name of putrid diseases, founded on this notion, is altogether erroneous. Nay it is remarkable, that the blood drawn in diseases frequently so called, putrefies, instead of more quickly, more slowly than healthy blood; as was shewn long ago by Lynd in his work on the scurvy, and has been more recently insisted on by Deyeux and Par-

mentier. The idea, also, that in rubeola, scarlatina, varicella, and variola, and other eruptive fevers, there is any primary vitiation of the blood, is equally hypothetical and improbable. It is true, the blood in the *course* of these diseases becomes vitiated, sometimes to a very remarkable degree, owing to its impregnation by means of absorption with the vitiated secretions of the body; and the said blood, applied to the bodies of other animals, is capable of producing very bad symptoms, as has been proved in respect to variolous blood at least, by Gendrin, Gaspard, Magendie, Bouillaud, and others; but we have no proof of any *primary* vitiation, for the blood is incapable of producing a specific disease. Dr Home's experiment with rubeolous blood is not conclusive; and in the experiments with variolous blood, whatever else it produced, it never produced variola.

It has been considered to favour this view of the primary vitiation, that children have been not unfrequently born with the variolous eruption upon them, when the mother during pregnancy has been affected with the disease, while the only communication between the child and its parent is by the blood, or fluids derived immediately from it (Hunter, Whytt, Forbes); but it was forgotten in the mean time, that a halitus was continually escaping from the surface of the mother, which might easily be supposed capable of affecting the fœtus in the womb, the body of the mother acting as a kind of fomes. That this is the way in which the disease is in these instances communicated, seems to be obvious from the fact, that unborn children have been frequently so affected, by the mother

having been exposed to the contagion of variola, when she herself was exempt from the disease.* (Mead, Mauriceau, Jenner, Pearson, Kite, Turnbull, &c.)

* [In more recent times there has been a prevailing, and at present rapidly increasing, disposition among pathologists, to direct more attention to the condition of the fluids, more especially of the blood, in various diseases,—a subject which had in later years, from the exclusive prevalence of solidism, fallen into neglect; and there is reason to believe that the careful investigation of the changes that occur in the blood may be the means of filling up many of the gaps that at present exist in pathology. It is remarkable that, notwithstanding the extension of this opinion, and its adoption by a great many of the most distinguished pathologists of the day, there is confessedly a very great want of positive evidence on the subject derived from facts; and while many, aware of this deficiency, announce their opinion with great diffidence, others confidently attempt to revive the old doctrines of humorism, and explain many diseases by a primary vitiation of the blood. This doctrine they conceive particularly adapted to an explanation of the exanthematous diseases, and many fevers, in which, according to this view of the subject, there is an actual morbific matter present in the blood, which gives rise to certain changes in that fluid; and the result of these is the expulsion of this deleterious substance, in the case of the exanthemata, by the skin in the form of an emption, and in that of other febrile diseases, by the deposition of morbid products of various kinds in various places. Of these views it may be sufficient to remark, that although plausible, they are too hypothetical to be considered here.

In the present state of knowledge, it would of course be inconsistent with the plan of this work to enter into a full detail of all the changes that the blood has been observed to undergo in the course of diseases, and of the conflicting opinions held upon the subject; but it may not be uninteresting to mention some of the best ascertained facts relating to the condition of this fluid in a few of the most important diseases, and the opinions of the most distinguished pathologists on the subject.

We may begin with the changes in the relative proportion of the natural constituents of the blood,—a subject on which much accurate information has been added by the recent memoir of Andral and Gavarret (Annales de Chimie et de Phys. vol. lxxv. p. 225.) The

normal proportions adopted are those of Le Canu, viz., per 1000, fibrine 3, solids of serum 80, including 8 inorganic, globules 127, water 790.

Andral recognises four great classes of alteration in the blood.

The 1st,—*Increase of the fibrine.* This is constant in all acute inflammations, also in certain stages of pulmonary tubercles, cancer, and probably other accidental products; but here it is doubtful whether it depends on these morbid states, or on the inflammation that accompanies them. It is so constant, that if the blood contains above 5 of fibrine, he does not hesitate to affirm that there exists one of the morbid states included in this class, either primary or as a complication; or if it contain less than 4 of fibrine, he denies the existence of a true acute inflammation.

2d Class.—The globules increased beyond their usual quantity, while the fibrine remains normal or even less, generally indeed less, and always so in relation to the globules.

This includes the pyrexiæ or fevers, and some cerebral hæmorrhages. These relations are not, however, so constant as the increase of fibrine in the phlegmasiæ; but it is at least certain and constant that the fibrine is not increased in fevers, and the less the amount of fibrine, the more the fever possesses the adynamic character.

3d Class.—Diminution of the globules. This occurs in chlorosis, diabetes, dropsy, &c.

4th Class.—Diminution of the solids of the serum, as in Bright's disease. These states may be complicated, as, for example, acute inflammation in a chlorotic woman would cause increase of the fibrine, while the globules still remained deficient. Other circumstances, such as want of nourishment, loss of blood, &c. may have influence on those relations. The constant effect of bleeding is to diminish the number of the globules; it has less influence on the fibrine, which sometimes diminishes under it, sometimes increases, and often remains unaffected. Its influence on the solids of the serum is likewise variable.

Diseases of the first class. In acute articular rheumatism the fibrine was constantly increased, the mean amount being between 7 and 8. The increase of fibrine seemed to depend more on the intensity and extent of the pain, than on the duration of the disease. There was no change observed in the globules, nor in the solids of the serum, in this disease.

In subacute and chronic rheumatism the quantity of fibrine is always greater than normal, but not nearly so much so as in the acute form of the disease.

In pneumonia the amount of fibrine is even more increased than

in rheumatism, the mean being 8. It keeps pace, as in rheumatism, with the intensity of the disease.

In acute bronchitis, pleuritis, peritonitis, amygdalitis, and erysipelas attended with fever, the quantity of fibrine has been found always increased. The quantity of globules is not observed to bear any fixed relation to the extent or intensity of the disease; and Andral remarks, that these facts show the fallacy of attributing the disposition to inflammation to the abundance of the clot, which is essentially composed of the globules.

In pulmonary tubercles, there is an increase of fibrine and diminution of globules in all the stages of the disease, but not equally marked in each. In the crude stage the increase of the fibrine and diminution of the globules are inconsiderable: the mean of the former may be estimated at 4. When they begin to soften, the fibrine increases to 4·5, and the number of globules continues to diminish. When caverns are formed, the fibrine rises to 5, but when marasmus has set in, it sinks to 2·1. It reaches its maximum at the commencement of the continued fever. In this disease there is also a great increase in the quantity of albumen. The globules go on constantly diminishing, but even in the third stage Andral has never observed them below 83, while in chlorosis they sink much lower. In diseases of the heart there is also a considerable diminution in the proportion of globules.—(Le Canu.)

2d Class.—In typhus fever (*i. e.* the abdominal typhus of the continent), according to Andral, except when it is complicated with an accidental inflammation, the quantity of fibrine is never increased; it sometimes remains the same, but is often diminished: this observation is corroborated by Louis. According to Chomel (p. 199), it is always diminished, even although an acute inflammation occur in the course of the disease. Thus it exhibits a relation contrary to that in all inflammations. For while in inflammations the increase of fibrine is in direct ratio to the intensity of the disease, in typhus it diminishes as the fever becomes more severe; and this may go to such an extent as to present the minimum quantity of fibrine, and far exceeds what would be caused by bleeding or fasting, or by any other disease.

Another characteristic of typhus is the increase of the globules, although in the course of the disease they may sink below the natural standard.

In scarlatina and measles, the quantity of fibrine usually continues normal, but in general the globules are very considerably augmented

in number. The changes in variola are not constant; the fibrine however is in general somewhat increased. In the cases of intermittent fever, in which the blood was drawn at all the different stages, no change was observed in the amount of fibrine and globules until the patient had become exhausted with the disease, when the latter diminished. In cerebral hæmorrhage, the globules are sometimes so much increased, and the fibrine so much diminished, that Andral is disposed to refer the cause of cerebral hæmorrhage partly to this state of the blood.

3d Class.—In the cachectic state following intermittent fevers of long duration, lead cachexia, diabetes mellitus, and still more remarkably in chlorosis, there is a spontaneous diminution in the number of the globules; also in typhus, according to Le Canu and Bouillaud. In the latter disease they have been known to fall as low as 27·9. In all the cases of chlorosis that were observed, the amount of fibrine remained unaltered, unless augmented by the occurrence of an acute inflammation in the course of the disease.

In scorbutus, according to Fourcroy (Elémens de Chimie de M. Orfila, t. ii. p. 313), the blood remains black on cooling, and, instead of a clot, forms only gelatinous masses.

4th Class.—A deficiency of the solids of the serum is observed most remarkably in Bright's disease. The deficiency of albumen in the blood is found to be in the ratio of the quantity of it found in the urine. In many malignant fevers, cholera, and some other diseases, a notable diminution of the saline ingredients of the blood has been observed to take place.—(Stevens on the Blood.)

On foreign matters in the blood.

The question of the absorption of miasms has been already considered, and it appears that some contagious miasms, as glanders and pustula maligna, are certainly absorbed into the blood; and it is probable that many others likewise enter the circulating system. Some of the modern humoral pathologists, however, theorizing from a few such facts, have endeavoured to revive the ancient doctrine of the action of miasms, ascribing to them the power of exciting a sort of fermentation in the blood, which they believe to be the cause of the disease. Thus one writer observes,

"The miasm is absorbed into the blood, which, being thus infected, is thrown into a state of excitement, and re-acts against the foreign element thus forced upon it, and endeavours to throw it off. A sort of fermentation then takes place, by which the blood purifies itself, while the ferment is eliminated and precipitated."—(Rösch, über die Bedeuting des Blutes, p. 61.)

This is applied chiefly to the exanthemata; but here it must first be demonstrated that the miasm is present in the blood *before* the eruption, which is thus supposed to be the throwing off of the morbid matter, and not afterwards; but precisely in these diseases we have no proof that the miasm enters the blood at any stage. And it is well remarked by Henle, that hydrophobia, the disease in which the entrance of the poison into the blood is about the best established, runs its course without any crisis or exanthema.

Pus in the blood. Although it has been shown by Mr Hunter and others, that the absorption of pus is not the cause of hectic fever, and that often large collections of matter are absorbed without injury; yet numerous facts tend to the conclusion, that many of the secondary phenomena attending suppurations are to be attributed to the contamination of the blood by the admixture of purulent matter. This is observed particularly in phlebitis, especially puerperal, where the pus is poured directly into the blood.—(Gluge, op. cit. p. 79.) The secondary phenomena consist in purulent depositions or metastatic abscesses in various organs, attended with a train of well-marked characteristic symptoms. The order of the frequency in which the different organs are affected is fixed, and is worthy of notice. The lungs are most frequently affected; and here it always takes the form of lobular inflammation and abscess. Next, and almost as often, the spleen is the seat of purulent depositions; next the liver and kidneys, and sometimes, though more rarely, the brain, the eye, the thyroid gland, the joints, and the subcutaneous and intermuscular cellular tissue. That these secondary abscesses, or purulent metastases, are caused by the actual presence of pus in the blood, and not by sympathetic irritation, is rendered highly probable by the experiments of Günther (Rust's Magazin, xl. heft 2), who injected pus into the veins of horses, and soon afterwards found lobular abscess in the lungs. Cruveilhier and Leuret (Dict. de Science Méd.) also found that injecting putrid substances into the veins produced all the organic changes resulting from absorption of pus, and the symptoms commonly attending it.

Certain rare cases have been observed, in which the symptoms commonly attributed to the presence of pus in the blood have presented themselves; and pus globules have even been said to have been detected in the blood, without any inflammation of the veins or local deposition of pus at all.—(Gluge, Mandl.) In such cases the blood has been said to undergo spontaneous transformation into pus, and the terms purulent diathesis (Mandl) and pyemia have been applied to such a state; and some even go so far as to represent the blood as capable of inflammation *per se*, and indeed frequently use the term hæmi-

tis.—(Piorry.) Satisfactory evidence of even the probability of such is entirely wanting. Among the products of inflammation, coagulable lymph has also been said, by its actual presence in the blood, to give rise to secondary inflammation. This is observed in inflammation of the internal coats of the arteries, and especially the endocardium; in which case the exuded lymph is supposed to mix with the blood, and give rise to those secondary depositions of lymph in the spleen, and frequently also the kidneys, which *always* accompany endocarditis.—(Rokitansky.) Among morbid products, tuberculous and encephaloid matters have been detected in the blood (Carswell, Magendie, Beclard, Velpeau) in the latter stages of cases of those diseases in which the local affection is extensive; and although these, as well as the sanies from gangrenous and foul sores, may give rise to bad effects, yet there are not any specific morbid changes, or secondary depositions of similar morbid matters, observed in such cases. Many of the phenomena, however, of the acute form of tuberculosis, which has recently attracted much notice, have inclined some pathologists to the belief that the blood is essentially implicated in that disease. Among these may be mentioned the simultaneous deposition of the tubercular matter over such a large extent in the same organ, and in many organs at the same time, and the order of frequency in which such deposition takes place, which, it will be remarked, is nearly the same as purulent depositions, viz. most frequently in the lungs, next the spleen, then the kidneys, and then the serous membranes. (See note to article Tubercle).

"It will be perceived," observes Dr Babington, at the conclusion of his able article on the morbid state of the blood, "that our knowledge of this subject still remains extremely defective. We learn, indeed, that under the existence of disease, the different constituents of the blood are liable to morbid increase or diminution, as well as to certain alterations in their sensible qualities, hitherto less accurately examined,—that there are instances in which principles not usually met with in the healthy circulation may be detected in it, and others where those which are always present in a state of health do nearly if not altogether disappear. But that which still remains unknown, and to which it is of the highest interest and importance our investigations should be directed, is the connection that these changes have with the diseases they accompany, and the position they occupy in the relation between cause and effect."]—Editors.

CHAP. IV.

ALIMENT.

SPONTANEOUS COMBUSTION—EXCESS OF VEGETABLE FOOD, OF ANIMAL FOOD, OF FERMENTED LIQUORS—GOUT—CHOLERA—DIABETES—SUGAR IN BLOOD IN DIABETES—SCORBUTUS—CUTANEOUS DISEASES—POISONS, ABSORPTION OF—[POISONS FOUND IN BLOOD AND EXCRETIONS—RAPIDITY OF ABSORPTION]—NATURE OF POISONS—DISEASES PRODUCED BY—FUNCTIONAL DISEASES HOW CAUSED—DIMINISHED SUSCEPTIBILITY TO POISONS.

Another head of exciting causes of disease includes the consideration of *aliment*. Besides the general predisposition to certain diseases produced by the habitual use of a certain diet and want of food in general, which has been before alluded to under the head of predisposing causes, accidental irregularities in this respect are among the most common exciting causes of numerous diseases. As to individual diseases attributed to peculiarity of diet, the principal of these are, besides fevers,—in the pulmonary organs, laryngitis; in the intestinal canal, pharyngitis, inflammation of the gullet, gastro-enteritis, worms, cholera, diarrhœa, hæmatemesis, and tympanites; in the urinary organs, nephritis, calculi, and diabetes; in the mouth, scorbutus; in the skin, urticaria, and many other diseases; in the organs of voluntary motion, gout, rachitis, besides various functional diseases, such as asthma, dyspepsia, gastrodynia, colic, delirium tremens, palsy, and nervous apoplexy. That epidemic fevers commonly arise under circumstances of great priva-

tion, as among routed troops in confined garrisons, in prisons and military hospitals, &c., is sufficiently well known. This circumstance requires no explanation.

It is persons addicted to dram-drinking who are chiefly the victims of spontaneous combustion. Several cases of this kind are related in numbers of the Philosophical Transactions; and a collection of such was made in Germany by Mark in 1809, and by Kopp in 1811, the latter of whom gives the history of no fewer than seventeen, most of which occurred in the persons of drunken old women. By Vicq d'Azyr Lair, Dupuytren, this kind of combustion has been considered, not as spontaneous, but as occasioned by the flames of a candle, &c. acting upon the body, rendered, some way or other, preternaturally combustible, while Le Cat, Mark, and Kopp, have ascribed it to the ignition, by the electric spark, of certain inflammable gases generated within the cellular tissue; but the objections to these hypotheses are sufficiently manifest, and it must be confessed that every hypothesis upon the subject is in many respects unsatisfactory. In most of the recorded cases of spontaneous combustion, the victims of it were in a state of stupor or nervous apoplexy; but a very extraordinary case of local combustion without any apoplexy was related by Rudolphi in 1825. In this instance the inflammable matter was evidently a secretion from the surface, probably of the nature of phosphuretted hydrogen; and a similar explanation might perhaps be given of all the cases on record.

Laryngitis is said to be a consequence of frequent dram-drinking; cynanche pharyngea, inflammation,

and scirrhus of the gullet, often result from liquids taken too hot; while iced or cold liquids, taken while the body is hot, are a common exciting cause of gastro-enteritis.

Having mentioned scirrhus, it is proper to observe, that in explaining scirrhus in general, a primary vitiation of the blood has again been put in frequent requisition as a part of its exciting cause, the said blood having been supposed at one time, as by Parè, to be loaded with bile; at another, as by Dionis and Carmanati, with an acid; at another, as by Wiseman, with an alkali; at another, as by Peyrilhi and Ewart, with arsenic; but it is hardly necessary to observe, that all such suppositions are in the highest degree vague and absurd.

Intestinal worms are commonly supposed to be occasioned by eating unripe fruits, diarrhœa and cholera are frequently traced to some error in diet, and intestinal tympanites is said often to arise from the use of leguminous vegetables; the operation of all which, in producing their respective diseases, is sufficiently intelligible, if it be true, as we shall endeavour in future to show, that all these affections have their origin in inflammation. A too full meal of animal food, and fermented liquors, is one of the most frequent causes of nephritis, going on to some kinds of urinary calculi. The operation of this cause is obvious, viz. the strong stimulus afforded by sympathy to the kidneys. It is one of the most common opinions (Wollaston and Magendie, &c.) to regard urinary calculi of the lithates as dependent upon a prevalence of lithic acid (arising from too much azotised food) in the blood. To this there are many objections; amongst

the most remarkable are, the exemption of sailors from calculi, out of 96,637 of whom, only eight were affected with the disease; as well as of carnivorous animals in general. It is equally occasioned also by the use of spirituous liquors. This deposition likewise is not more azotised than others. Why should we not equally ascribe the liability to calculi of the phosphates to too much calcium or phosphorus taken with the food? Not long ago the deposition of tubercles was ascribed to too much oxygen, probably with as much reason. With respect to gout, it is unquestionably a frequent consequence of intemperance in the use of animal food and fermented liquors, and (but not in the way commonly supposed) not owing to any vitiation of the blood.*

* This doctrine originated with the chemical pathologists, who chose to represent the blood in this disease as adulterated with a tartaric, at other times with a bilious salt; sometimes with an alkali, at others with an acid. Cullen has the merit of having done much to abolish this absurdity; but since the unfortunate discovery in 1797, that the calculi deposited in the bursæ mucosæ in this disease contained lithic acid, which acid unluckily contains nitrogen, it has again been confidently presumed that gout (like nephritis aud urinary calculi) arises from a superabundance of this principle, and that animal food is instrumental in producing it, by affording this principle in excess; and this view of the matter seems to be backed by the old observation that gout and gravel are frequently combined. It is needless to repeat here the numerous objections already stated to this wild hypothesis, as well as to that founded upon it, and supported by many "leapers to conclusions" among ourselves, that it consists in an abundance of ready-made lithic acid in the blood. In Asiatic cholera the blood has by some (Dr Stevens, &c.) been represented as primarily affected,—turned into an infected jelly for one thing, and of a prodigiously dark colour for another; the latter change dependent, of course, on too little salt in the serum. These, however, are not primary, but secondary changes of the blood, and arise from the depression of the powers of circulation; so that through the tardy flow of the blood through the parenchyma, its molecular changes are

The commonly assigned exciting cause of diabetes, on the contrary, is too much vegetable food; but this notion appears to have arisen from an unsatisfactory theory respecting its nature,—this disease also, like so many others, having been referred to an impure state of the blood, which has been commonly supposed to be too little azotised, an effect which too much vegetable food was imagined to concur in producing. It is indeed certain that the serum of the blood, in this disease, is more opaque than natural, and that the blood, as shewn by Nicolas and Guedeville, is preternaturally liquid,* and, as shewn by Rollo, is excessively slow in putrefying. Nay, it has even been asserted by Dobson and Rollo, that it contains ready-made sugar; but this assertion has been abundantly disproved by Wollaston, Marcet, Thenard, Vauquelin, Ségalas, and many others.† The changes, in fact, which the

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so sparingly affected that it undergoes a partial coagulation. The use of warm saline injections is not to dilute the jelly aforesaid, nor to impart salts, but merely to afford a transitory stimulus to the heart, and thus accelerate for a time the circulation.

* [Nasse (Pathologische Untersuchungen des Blutes) represents the blood in diabetes as containing a smaller amount than natural of alkaline salts, and the serum a less quantity of albumen; and that some of those peculiar globules presenting a notched appearance, which are commonly met with in inflammatory diseases and pregnancy, are also present in this disease.]—EDITORS.

† [More recent researches, however, have completely established the existence of sugar in the blood of diabetic patients. It was discovered in the year 1835 by Maitland in this country, and Ambrosiani in Milan, which discovery was afterwards confirmed by Macgregor of Glasgow, and Guibourt of Paris. The reason why the other distinguished chemists failed in detecting the sugar is, according to Bouchardat of Paris (Revue Médicale, Juin 1839), that its amount varies very much at different periods of the day. It is in greatest abundance some hours after eating, and gradually dimi-

blood displays in diabetes are not more remarkable than those which it undergoes in numerous other diseases already alluded to, and may be with much greater reason regarded as the result of the disease, than as constituting any part of the exciting cause. The character of the blood in all cases depends much upon the quantity of solid tissues and liquid secretions which are absorbed into it, as both these soon become not only diminished in quantity, but changed in quality; and in diabetes it is easy to infer that the blood cannot long retain its natural character, without presuming that it had undergone any primary vitiation.*

nishes after that time, and, if no nourishment be taken for twelve or fifteen hours, wholly disappears. Now, as the patients whose blood was examined were bled usually in the morning, as might have been expected after the abstinence of the previous night, there was no sugar present in the blood.]—EDITORS.

* With respect to scorbutus, salted animal food taken for some time without a fair proportion of vegetables, any sudden change in the aliment, or an absolute want of food, are among its chief exciting causes; as a poor diet, in general, sometimes produces that modification of scorbutus called purpura, both probably arising from these peculiarities in the diet operating, like cold, in affording an insufficient stimulus to the body in general, and not, as is commonly supposed, producing blood of a deteriorated quality, which we have no proof constitutes any part of the exciting cause of the disease. The blood, in the advanced stages of scorbutus, it is true, like that in nervous apoplexy, typhus, and other malignant diseases, is more attenuated than natural, and, when drawn, does not coagulate in the usual manner. In the early stages it not only coagulates, but displays even, according to Lynd and Parry, all the phenomena of inflammatory blood; and it is quite false that at any period it is, as has been supposed by Cullen and others, more alkaline than usual (a supposition which was disproved by Deyeux and Parmentier): nay, an immoderate use of acids, like any other deficiently nutritive substances, may even produce it. (Stevens on Blood, 1832.) Nor has it a greater tendency, nay, it has

Insufficient nourishment is very frequently productive, in infants, of rachitis, as in adults, of scorbutus; and here also it frequently co-operates with cold and other negative agents, and in all probability produces in the vessels of the bones effects similar to those produced on the vessels of the soft parts in scorbutus, that is, a state identical with, or analogous to, inflammation; from which results, probably, a deposition of water, and a consequent absorption, by means of its pressure, of the earthy matter.* Here, again, a primary vitiation of the blood has been put in requisition as the exciting cause of the disease; but

even a less tendency, to putrefaction than healthy blood, as has been shewn by Lynd. The state of the blood, then, in the early stage, is obviously the result of inflammation; and this, when it has become chronic, and gone on to a deposition of vitiated solids and fluids all over the body, may easily explain how the blood becomes gradually corrupted by their continual absorption. It is remarkable that all the exciting causes of scorbutus are negative agents, viz. cold, want of nourishment, want of exercise, and depressing emotions; and it seems easy to understand, from what has been already said of the effects of cold, how such causes may co-operate in producing, in the capillary arteries of various parts, a state, if not, as supposed by Lynd and Parry, identical with, certainly analogous to, inflammation, to which all the phenomena of scorbutus may be referred. This, however, will be treated more fully when the subject of hæmorrhage comes to be discussed.

* This explanation, that rachitis arises from inflammation, is strongly confirmed by the observations of Boyer, that such bones usually abound in a thin fluid, which commonly extends from the central parts, where the cellular tissue is most copious, to the surface, where it is least so, and which may be squeezed from them as from a sponge; and it was noticed by both Boyer and Beclard, that such a bone is not only "ramolli," but "rouge;" and in all the cases where this disease, as well as mollities ossium, has been sudden or extensive, the softening of the bones has been preceded by violent pain and fever.

this idea is wholly unsupported. It has been said that mollities ossium may result from too copious a use of salt: of this there is no certainty. Certain other peculiarities of diet, as the use of cream, cheese, honey, cucumbers, the kernels of fruits, &c., are a frequent exciting cause, according to the idiosyncrasy of the individual, of urticaria, lepra, pityriasis, pomphylix, and other cutaneous eruptions, all which seem to arise in these cases from sympathy with the stomach; and it is thus that psoriasis, acne, &c. frequently result from cold drinks taken when the stomach is hot.

POISONS.

It belongs to this place also to speak of the operation of the various kinds of poisons. In explaining their action, very little consideration is perhaps due to the organ by which they first enter the body, and still less seems to be called for as to the medium of their propagation. We know that every part of the body has a susceptibility of impressions peculiar to itself; and that every agent upon the body, and consequently every poison, brings with it a peculiar stimulus; consequently, without denying that many poisons *may be*, and some certainly *are*, absorbed, there seems to be very little occasion to assign this as an essential condition of the influence of any poison upon any part of the system. The more or less close sympathy by which all the organs of the body are associated together sufficiently explains it. All that is essential to the action of poisons in distant organs, when locally applied, seems to be, 1st. that the nerves of the parts to which the poison is applied

should be sufficiently exposed, as in wounds; 2d. that the surface on which it acts be extensive enough to bring a sufficient quantity of the poison at once into action, but still not so much as to weaken this action by too great diffusion, as in the lungs; and, 3d. that the part primarily irritated have a sufficient sympathy with the rest of the body, as is the case with the stomach.

Now, let a part possessed of all these conditions in an adequate degree be exposed to a poison,—how will its action be increased by the absorption of the poison (admitting this to be the case, as it no doubt frequently is) into the blood? It can now only act upon the inner coats of the blood-vessels; and is it not possible that, partly by the too great extent of these, and partly by the dilution of the poison, its action, as far as depends upon the circulation, will be rather weakened than strengthened? It is a vague idea that poisons, whenever they are absorbed into the blood, being carried everywhere, as, for example, to the brain, have full scope for their action; for it must be remembered, that the blood, to whatever organ it is carried, is always *in its own vessels;* and it is on the coats of these alone that poisons, when absorbed into them, can operate; and as the quantity in the vessels in any given organ must bear but a very small proportion to the whole, whereas the effects upon the organ of sympathy, with any primary seat of the irritation, may be conceived to be almost concentrated, it is easy to imagine that poisons may often lose rather than gain in energy by having been taken up by the blood. But even when a poison has been absorbed, it is not perhaps so much upon the circulation of the blood, as

upon sympathy between distant organs, or some particular vessel or set of vessels as the seat of primary irritation, that the general action of poisons depends; it having been proved by Messrs Morgan and Addison in 1829, that when injected into a vein, their general action is often equally energetic, although the circulation through the vein be obstructed. Even when absorbed, then, it is fair to conclude that the action of poisons is not necessarily promoted, and may even be diminished, by being conveyed along with the circulating blood; and when it is so promoted, it can be attributed only to the specific irritability of the coats of the blood-vessels being better adapted to this particular stimulus, than that of any other part of the body, to which the poison may have been applied.

This subject has been already alluded to when speaking of the peculiar influence of miasms in producing certain diseases, and it will be treated more at length when the general action of medicines comes to be considered.

In the mean time, the fact cannot be too forcibly insisted upon, that we have no evidence whatever that any primary change in the blood (the presumed necessity of which has been principally instrumental in propagating the vague notion respecting the absorption of poisons) is at all essential to the action of any one of them. It is much more probable, that when poisons operate on parts at a distance from the organ to which they have been directly applied, they do so by exciting in the organ a peculiar irritation, which, when conveyed by sympathy to the other parts of the body, produces its principal effects on that part which

is most adapted by its specific irritability to be so acted upon.

In addition to the facts already stated, 1st. That their effect is not impeded by preventing the circulation from the part primarily affected, it may be asked,

2. If otherwise, why are the organs to which the poisons are applied in general more affected than any other?

3. Why should not only THAT organ, but any other, be more affected than all the rest?

4. How is it that they cannot in general be detected in the blood?

5. How is it that the circulating blood of a poisoned animal does not in general affect another animal to which it is admitted by transfusion? (Mayer, Morgan, and Addison.)

6. How is it that the flesh of poisoned animals is generally not vitiated?

7. How is it that the same diseases as are produced by poisons often result from other causes, as cold, to which no absorption of morbific matter can be suspected? Tetanus arises equally from a rusty nail as from upas. (Magendie.) All poisons may be absorbed, but no poison is necessarily so; and whether absorbed or not, all act directly or sympathetically upon the nervous system alone.*

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* As more recent observations afford a satisfactory answer to many of Dr Fletcher's objections, and show that he has greatly underrated the frequency of the absorption of poisons, and its importance as an element in their action, we think it right to subjoin a few of the most convincing of these.

Numerous experiments have been made to ascertain whether the action of poisons is impeded by stopping the circulation that con-

With respect to the peculiar nature and source of the deleterious principle in each of the several sub-

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nected the part to which they were applied with the rest of the system. Among others, Mr Brodie bound the leg of a rabbit with a tight ligature, leaving out only the nerve, and then injected *woorara* poison into the foot; no symptoms of poisoning ensued until he had loosed the ligature.—(Phil. Trans. 1812, p. 107.) A. Herr observed the same results in a corresponding experiment made with hydrocyanic acid and strychnine on frogs. The thigh of a frog was divided, with the exception of the nerves and bone, and the artery tied, then ticuna poison was applied to the foot without any effect on the system following.—(Herr's Theorie der Araneiwirkung, Freiburg, 1836.)

When hydrocyanic acid is applied to the limb of an animal, if the aorta be bound, the poison produces no effect until it is unbound, and then it acts with great rapidity.—(Emmert, Diss. inaug. de Venenatis acidi Boruss. effectibus, Tub. 1809.) Schnell bound the aorta of a rabbit between the renal and superior mesenteric artery, and put gr. ii. of upas poison into a muscle of the leg, then an additional grain; after eight hours no effect was observed. He then unbound the aorta, and symptoms of poisoning appeared.—(Historia Veneni Upas, Antiar. Tub. 1815, p. 31.)

Lastly, the well-known experiment of Magendie may be noticed. He isolated the leg of a dog entirely, and kept up the circulation by means of a quill: symptoms of poisoning followed four minutes after the introduction of the poison into the paw. The experiment has been repeated by Pereira, Lloyd, and M'Murdoch, with the same result.

The conclusions in favour of the sympathetic action of poisons, drawn from Morgan, and Addison, and Fodera's experiments, which shewed that many substances acted equally when injected into a vein, although the circulation in it was prevented by ligatures placed above and below the part of the vessel where the poison was introduced, are considerably invalidated by the fact that a vein so operated on, if cut out and put into the abdomen of another animal, produced exactly the same symptoms, as this seems to shew that the effect may be ascribed to *exudation* in the former case, and not to *sympathy*.—(Herr.)

A considerable number of substances has likewise been detected in the blood, among which are iodine, hydrocyanic acid, arsenic, quicksilver, lead, camphor, assafœtida, indigo, and musk ; and the following table exhibits those that have been found in the excretions, which must of course at one time have been contained in the blood.

Name of Substance.	1 Blood.	2 Urine.	3 Sweat.	4 Exhalation from Lungs.	5 Spittle.	6 Gall.	7 Milk.	8 Effusion in Pericardium.	9 Effusion in Pleura.	10 Effusion in Peritoneum.	11 Effusion in Brain.	12 Brain.	13 Spinal Marrow.	14 Liver.	15 Skin.	16 Muscles.	17 Diaphragm.	18 Bones.
Alcohol*	fnd.	...	...	fnd.	...	...	...	...	...	...	fnd.	...	...	...	...	...	...	...
Aloe	...	...	...	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...
Malic acid	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Arsenic	fnd.	...	...	...	...	...	...	...	...	...	...	...	fnd.	...	...	...	fnd.	...
Benjamin	...	fnd.	fnd.	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Valerian	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Baryta	fnd.	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mugwort	...	fnd.	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Succinic acid	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Castor	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hyoscyamus	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Prussic acid	fnd.	...	...	fnd.	...	...	...	...	fnd.	fnd.	...	...	...	...	...	...	...	...
Prussiate of potash	fnd.	fnd.	...	...	...	fnd.	fnd.	fnd.	fnd.	fnd.	...	...	...	...	...	...	...	...
Lead	fnd.	...	...	...	...	fnd.	...	...	...	...	...	...	fnd.	...	...	fnd.	...	...
Borax	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Camphor	fnd.	...	fnd.	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Citric acid	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Copaiva balsam	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Turmeric	...	fnd.	...	...	...	...	?	...	...	...	...	...	...	...	...	...	...	...
Animal oil	fnd.	fnd.	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Violet	...	...	...	...	...	...	fnd.	...	...	...	...	...	...	...	...	...	...	...

* Fnd. for found in.

Iron	fnd.	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vinegar	...	...	...	fnd.	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...
Madder	fnd.	fnd.	...	...	...	...	fnd.	...	...	...	...	...	...	...	...	...	...	...
Toad-stool	...	fnd.	...	...	...	...	fnd.	...	...	...	...	...	...	...	...	...	...	...
Gelatine	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gallic acid	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gentian root	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gamboge	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bilberry	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sulphuretted hydr.	fnd.	fnd.	fnd.	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Indigo	fnd.	fnd.	fnd.	...	fnd.	fnd.	...	...	...	...	...	...	...	...	...	...	...	...
Iodine	fnd.	fnd.	fnd.	...	fnd.	...	fnd.	fnd.	fnd.	fnd.	...	...	...	...	fnd.?	...	...	...
Iceland moss	...	...	...	...	...	...	fnd.	...	...	...	...	...	...	...	...	...	...	...
Potash	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Muriate of potash	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Carbonate of do.	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Nitrate of do.	fnd.	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sulphate of do.	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Oxalic acid	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Garlics and onions	...	fnd.	fnd.	fnd.	fnd.	...	fnd.	...	...	...	...	...	...	...	...	...	...	...
Copper	...	...	...	...	...	...	...	...	...	...	...	...	...	fnd.	...	...	...	...
Ligustrum lev.	...	...	...	...	...	...	fnd.	...	...	...	...	...	...	...	...	...	...	...
Almond oil	...	fnd.	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Horse-radish	...	...	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Musk	fnd.	fnd.	fnd.	fnd.	...	...	...	...	fnd.	fnd.	...	...	...	...	...	...	...	...
Mentha silvestris	...	...	...	...	...	...	fnd.	...	...	...	...	...	...	...	...	...	...	...
Soda	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Carbonate of soda	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sulphate of soda	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Opium	fnd.	fnd.	fnd.	...	...	...	fnd.	...	fnd.	...	...	...	...	...	...	...	...	...
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Name of Substance.	Blood.	Urine.	Sweat.	Exhalation from Lungs.	Spittle.	Gall.	Milk.	Effusion in Pericardium.	Effusion in Pleura.	Effusion in Peritoneum.	Effusion in Brain.	Brain.	Spinal Marrow.	Liver.	Skin.	Muscles.	Diaphragm.	Bones.
Quassia	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mercury	fnd.	fnd.	fnd.	fnd.	fnd.	fnd.	...	...	...	...	...	fnd.	...	...	...	fnd.	...	fnd.
Castor oil	...	...	...	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...
Rhubarb	fnd.	fnd.	fnd.	...	fnd.	fnd.	...	...	...	...	...	...	...	...	...	...	...	...
Safron	...	fnd.	fnd.	fnd.	fnd.	...	...	...	...	...	...	...	...	...	fnd.	...	...	...
Scammony	...	...	...	...	...	...	fnd.	...	...	...	...	...	...	...	...	...	...	...
Hemlock	...	...	...	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...
Mucilage	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Spurge laurel	...	fnd.	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Silver	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	fnd.	...	...	...
Sulpht. of potassium	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Stramonium	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tobacco	...	...	...	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...
Tannin	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Erythræa cent.	...	...	...	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...
Oil of turpentine	...	fnd.	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Juniper-berry	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tartaric acid	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tartrate of ammonia	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Wormwood	...	...	...	...	fnd.	...	fnd.	...	...	...	...	...	...	...	...	fnd.	...	...
Birdcherry	...	fnd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cinnamon	...	...	...	...	...	...	fnd.	...	...	...	...	...	...	...	...	...	...	...

stances commonly reputed poisonous, we know for the most part extremely little. When the substance in question is a vegetable, it may be often procured isolated; but when a mineral, the deleterious principle appears to reside in the substance collectively. In both these cases the poisonous principles result from a

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The following substances have also been found in the solid parts: quicksilver in the brain; lead in the liver, muscles, and spinal marrow; and copper in the liver. These were found by Pickel, according to Orfila.

The following experiments shew the very great rapidity with which substances are absorbed, which takes place perhaps as rapidly as the effects of poisons display themselves. According to Tiedemann (Zeitschrift, f. Phys. von T. &c., 1824, H. I. 3, 89-125), Hering introduced ferrocyanate of potash into the jugular vein of a horse, and found it in from 10 to 25 seconds in the maxillary artery, in from 15 to 20 in the maseteric, in from 20 to 30 in the metatarsal, in from 20 to 25 in the jugular vein of the other side, in from 20 to 30 in the external thoracic vein, and after 20 in the vena saphena.

According to Ségalas (Froriep's Notizen, bd. xiv. s. 249), after the injection of nux vomica into the windpipe, death followed as speedily (*i. e.* momentarily) as after its injection into the blood. The same happened with equal rapidity after tying the par vagum.

The following are among the few facts which support the opinion that the blood of poisoned animals is poisonous. Vervière (Herr, op. cit.) tied the foot of a dog with a strong ligature, and then injected some extract of nux vomica into a wound in the paw, and took blood from a vein between the wound and ligature: this blood proved fatal to another dog into which it was injected.

Drs Christison and Stevens observed, that when leeches were applied to the abdomen of a person poisoned with oxalic acid, soon after biting they fell off dead.

Although the facts above stated place it almost beyond a doubt that the majority of poisons are absorbed, yet there seems no evidence whatever that any part of their operation consists in a primary action upon the blood, which merely affords a vehicle for their conveyance to the capillary vessels, on which alone they all ultimately act. This view is adopted by Herr (op. cit.) in his very able summary of the facts, arguments, and experiments regarding the action of medicine, from which work we have derived most of those here brought forward.

combination of the primary elements of the substance in question, a combination effected in the former case by secretion; but with regard to the nature and source of the deleterious principle in most animal poisons (in all perhaps except cantharides) very opposite opinions have been entertained. The greater number of animals reputedly poisonous belong to the tribe of fishes, particularly those of the West Indies and other hot climates. Their poisonous qualities have been supposed by Clarke, Chisholm, and others, to depend on their feeding in certain poisonous places, or on poisonous animals, vegetables, and minerals. Others have imagined that the quality depends on the rapid decomposition of the fluids of these animals after death; while others, with Dr Edwards, attribute these deleterious effects, not to any principle in the animals themselves, but to the peculiar idiosyncrasy of the ndividual who suffers from them. To all these opinions there are some very obvious objections. Against the first, for instance, it may be urged that it is only, or chiefly, at certain seasons that most of these animals are poisonous, while their food, &c. is the same at all seasons; against the second, that the products of putrefaction or of decomposition of animal substances, though offensive, are not poisonous; and against the last, that whole companies are often equally affected after partaking of the same dish. It cannot be reasonably questioned that such poisons are the result of secretion. Nobody doubts that this is the origin of musk, of castor, and other animal medicines; and why should we doubt that it is also of animal poisons, which differ from medicines only in degree? The circumstance, also, of these substances being poisonous at certain seasons only, is strongly in favour

of this doctrine; for we know that the secretion of many of the lower animals undergoes remarkable changes with the time of the year; and this fact alone, independently of the consistency of this opinion with the theory that vegetable poisons are the result of secretion, might induce us without hesitation to adopt it. It was first formally proposed by Dr Burrows, and has been recently adopted by Dr Combe of Leith, and most other authors who have written on the subject.

The principal organic diseases produced by these substances received into the stomach, are—

Bronchitis	Chlorine		
Inf. of Gullet	Viruses	— Meloë	— Atropa
	Euphorbia	— Aconitum	— Ranunculus
	Iodine	— Oxalic A.	— Sulphuric A.
	Nitric A.	— Ammonia	— Lime
	Potassa	— P. of Arsenic	— P. of Mercury
Gastro-enteritis	Viruses and Venoms		— Meloë
	Honey	— Atropa	— Datura
	Strychnos	— Conium	— Cicuta
	Colchicum	— Laurus	— Euphorbia
	Hydrocyanic A.	— Aconitum	— Helleborus
	Ranunculus	— Digitalis	— Cucumis
	Momordica	— Menispermum	— Juniperus
	Veratrum	— Agaricus	— Iodine
	Chlorine	— Oxalic A.	— Phosphorus
	Sulphuric A.	— Hydrosulph. A.	— Nitric A.
	Ammonia	— Lime	
	Baryta	— Potassa	— P. of Zinc
	P. of Tin	— P. of Arsenic	— P. of Antimony
	P. of Copper	— P. of Mercury	— P. of Silver
	P. of Gold		
Cystitis	Meloë	— Arsenic	— Mercury
Glossitis	Arum	— Oxalic A., &c.	— Sulphuric A.
	Nitric A.	— P. of Arsenic	— P. of Mercury
Urticaria	Viruses	— Datura	
Phlegmatia Dol.	Viruses and Venoms		
Arachnitis	Viruses and Venoms		— Meloë
	Honey	— Alcohol	— Cicuta
	Colchicum	— Laurus	— Helleborus
	Veratrum	— Agaricus	— Carbonic Ox.
	Sulphurous A.	— P. of Antimony	
Jaundice	Viruses and Venoms		
Dysentery	Cucumis	— Helleborus	— Momordica
	Juniperus	— Arsenic	
Catarrh	Viruses		
Ptyalism	Digitalis	— Iodine	— Nitric A.
	P. of Mercury	— P. of Gold	
Hæmoptysis	Chlorine		
Hæmatemesis	Meloë	— Oxalic A.	— Sulphuric A.
	Nitric A.	— P. of Arsenic	— P. of Mercury
Hæmorrhois	Meloë	— Cucumis	— Momordica
	Juniperus		
Hæmaturia	Meloë		
Purpura	Venoms		
Tympanites	Agaricus	— P. of Arsenic	
Pneumatosis	Venoms		

In all these cases the disease excited is either simple inflammation of the parts affected, or an immediate consequence of such inflammation; and the only consistent way of explaining the action of the respective poisons in producing this effect, is by presuming that they act as immediate stimuli on the parts to which they are directly applied, producing there an irritation of a specific character; that this irritation goes in some cases to no other organ, but is succeeded in the part primarily affected by a collapse and consequent inflammation of that part alone to which the poison has been applied; but that where parts at a distance display the effects of the poison, that this primary irritation is conveyed to these parts by sympathy, and that this second irritation is followed in these parts by a similar collapse.

That each individual poison, like every other agent on the body, conveys with it a specific stimulus, and will accordingly produce, in the part to which it is immediately applied, a specific irritation, is unquestionable; and when we consider the immense extent of sympathies which connect every part of the body more or less with every other part, it is easy to believe that this specific irritation of one part will not always cease here, but will display frequently its principal effects on those distant organs to the specific susceptibility of which it is particularly adapted. It is only in this way that we can explain how the virus of poisonous fish, for example, received into the stomach, may excite, as has just been observed, arachnitis, jaundice, and catarrh; and how mercury, for example, in whatever way it be introduced into the system, may excite inflammation of the gullet, of the tongue, pty-

alism, gastro-enteritis, cystitis, and numerous other diseases; and this in both cases equally, perhaps, whether the poison be absorbed into the blood or not. That it is certainly so absorbed in some instances is unquestionable, but we have already endeavoured to explain that, whether absorbed or not, it is only through the medium of the irritability of the solids that it can directly operate in producing the disease in question; and why a fluid which is universally distributed should affect only certain organs, while it leaves the mass of the body uninjured, can be referred only to the specific susceptibility of the vessels of the former. In cases where we have evidence of the absorption of the poison into the blood, we may explain its effects on distant organs without calling in the aid of sympathy. In all cases, however, the doctrine of sympathetic irritation seems quite adequate to explain the resulting phenomena; and it is much more consistent with the well-known fact, that other kinds of primary irritation of certain parts, as wounds of a specific character, and so forth, when no absorption can be supposed to take place, frequently produce in distant parts, effects no less remarkable than those resulting from the several poisons. Nor is it any argument against the conclusion that sympathy is the chief means, that it supposes every organ of the body to which a poison can be applied, liable to as many distinct kinds of primary irritation as there are kinds of poisons, since the sympathetic action of such a poison can be different only as often as the primary irritation was so. The simple fact that the skin alone is liable to such a host of perfectly distinct diseases from different exciting causes, is of itself sufficient evidence that the characters of the irritation may be

as various as the stimuli which produce them; and what is certainly the case with respect to the skin, may be fairly presumed to be the case with respect to the stomach, and every other organ through which a poison may take effect on the system.

Among the functional diseases produced by various poisons, some of the principal are,—

Colic	P. of Lead		
Priapism	Meloë	— Datura	— P. of Arsenic
Tetanus	Venoms	— Secale	— Datura
	Strychnos	— Brucea	— Cicuta
	Hydrocyanic A.	— Aconitum	— Ranunculus
	P. of Arsenic	— P. of Antimony	— P. of Lead
Insanity	Meloë	— Hyoscyamus	— Atropa
	Datura	— Conium	— Aconitum
Delirium Tremens	Lolium	— Alcohol	— Hyoscyamus
	Atropa	— Datura	— Nicotiana
	P. of Mercury		
Epilepsy	Viruses	— Honey	— Secale
	Nicotiana	— Conium	— Cicuta
	Colchicum	— Laurus	— Hydrocyanic A.
	Papaver	— Helleborus	— Digitalis
	Arum	— Menispermum	— Veratrum
	Agaricus	— Carbonic Ox. &c.	— Phosphorus
	Hydrosulph. A.	— Nitrous Ox.	— Baryta
	P. of Arsenic	— P. of Antimony	— P. of Lead
	P. of Copper	— P. of Mercury	— P. of Silver
	P. of Gold		
Syncope	Atropa	— Nicotiana	— P. of Mercury
Amaurosis	Hyoscyamus	— Atropa	— Datura
	Cicuta	— Carbonic Ox.	
Idiotism	Datura	— Aconitum	
N. Apoplexy	Secale	— Alcohol N.	— Hyoscyamus
	Atropa	— Datura	— Nicotiana
	Strychnos	— Brucea	— Conium
	Cicuta	— Laurus	— Hydrocyanic A.
	Papaver	— Digitalis	— Agaricus
	Carbonic Ox.	— Carbd. Hyd.	— Sulphurous A.
	Hydrosulph. A.	— Nitrous Ox.	— Baryta
	P. of Arsenic	— P. of Antimony	— P. of Lead
	P. of Copper	— P. of Mercury	— P. of Silver
Local Palsy?	P. of Lead		

In all these cases, with the exception of colic (in producing which the action of the poison seems to be directly on the susceptibility of the part affected), the influence of the several poisons seems to take effect in disordering the functions through the medium of the spinal marrow and brain. This is obviously the case with respect to insanity and idiotism, in which the mental faculties alone are involved; and it is pro-

bably not the less so with respect as well to syncope, in which the action of the heart suffers, as to delirium tremens and nervous apoplexy, which involve both the mental faculties and voluntary motions, and tetanus, epilepsy, &c. which involve only or chiefly the latter. Thus, for the regular action as well of the heart as of the muscles of voluntary motion, a certain uniform stimulus from the brain and spinal marrow has been often represented as essential; and any thing less or more than this is productive respectively of diminished, increased, or irregular action. In the production of syncope, therefore, by belladonna and tobacco, it is not difficult to conceive that the permanent stimulus from the brain and spinal marrow, with respect to the heart, has been intercepted, in the same manner as occurs from the use of sedative and antispasmodic medicines. In the production of delirium tremens or nervous apoplexy, by the several poisons from which they result, not only the intellectual faculties have been suspended or weakened, but the same permanent stimulus has been intercepted with respect to the voluntary muscles, in the same manner as by the use of narcotic medicines; whereas in the production of tetanus, epilepsy, &c. by the numerous poisons from which they arise, it is probable that (the intellectual functions being in a great measure unaffected) the same permanent stimulus has been not intercepted, but increased, with respect to the voluntary muscles, in the same manner as by the use of stimulant and tonic medicines. This subject, however, cannot be made perfectly clear until we come to the explanation of the action of the several classes of medicines above alluded to, which differ from the

poisons under consideration only in the circumstances under which they are given. But in the mean time it may be observed, that they all seem to operate upon the capillary arteries of the spinal marrow and brain, so as to produce in these at one time a preternatural constriction, and consequently diminished deposition of nervous matter, consequently a diminished evolution of that stimulus which results from it, as in the case of sedatives, antispasmodics, and narcotics; while at another time they produce a preternatural dilatation of these arteries, and consequently an increased deposition of nervous matter, and a greater evolution of this stimulus, as in the case of stimulants and tonics. If therefore we can explain the action of the several poisons in producing inflammation (which consists in precisely similar states of the capillary arteries), and the various organic changes resulting from it, we shall have no difficulty in explaining their action in producing functional diseases also, and this equally whether the function affected belong to those commonly called organic, or those distinguished by the name of animal. The fact cannot be too often insisted on, that every agent, whether deleterious or healthy, acts upon the irritability alone, which is the only faculty which essentially distinguishes living matter from dead; and that when it appears to act upon the sensibility, the susceptibility of thought, or the power of voluntary motion, it does so only through the irritability of the capillary arteries of the brain and spinal cord.*

* The diminished susceptibility to the influence of poisons resulting from their continued use (analogous to that of the influence of certain

miasms already spoken of) is experienced principally with respect to those called narcotic and narcotico-acrid; and when we reflect that it was with these kinds of poisons alone that the ancients were acquainted, it is easy to understand how those stories should have originated in ancient times, of persons being quite exempt from the action of poisons. The poisons known to the ancients, with the exception of the celebrated love-philters,—the chief ingredients of which were cantharides, with which lascivious women were in the habit of plying their husbands and paramours, in order to make them libidinous,—seem to have consisted principally in henbane water, hemlock, opium, aconite, and so forth.

The reputed immunity, therefore, enjoyed by Mithridates king of Pontus, and produced, it was said, by the daily use of mithridatium, which contains several ingredients of this description, is easily explicable, as well as that of Aurelius, who is described by Galen as equally capable, from a similar cause, of resisting the action of the stronger poisons. These stories, however, sink into nothing when compared to that of the sultan of Cambaya, who, by the daily use of poisons, is said to have not only rendered his body invulnerable, but so impregnated with it, that his spittle touching the skin of any man immediately extinguished him, and his embrace was followed by instant death, so that he was compelled to have no fewer than 4000 concubines. It is hardly necessary to say that all the latter part of this story is fabulous.

CHAP. V.

SYMPATHY, AND THE PASSIONS.

SYMPATHY—METASTASIS—DISEASES ARISING FROM AFFECTIONS OF THE STOMACH—BROUSSAIS'S DOCTRINE—SYMPTOMATIC FEVER—OPINIONS ON FEVER—DISEASES PRODUCED BY THE PASSIONS—MODE OF THEIR OPERATION.

The next head of the exciting causes of diseases includes the consideration of sympathy; but on this subject, as so much has already been said, both while treating of the healthy functions of the body, and while explaining the action of several of the preceding classes of exciting causes of disease, it seems unnecessary to descant upon it at any length in this place. The excitement occasioned by this means in the respiratory muscles, from a stimulus applied to the lungs,—in the lachrymal and salivary glands, from one applied to the nostril,—in the mammæ, from one applied to the vagina,—in the muscles by which vomiting is effected, by one applied to the fauces,—in the gums, from one applied to the ears,—in the muscle which depresses the lower jaw, from one applied to the diaphragm,—in the muscles of the soft palate and abdomen, by one applied to the nostrils,—and in that of the glottis and abdomen, by one applied to the larynx,—is quite sufficient to shew the extensive influence of this agent during health; and that its influence is as

great, or still greater, in the production of disease, is unquestionable. It is accordingly by means of sympathy alone that all the exciting causes of disease already mentioned, *when they produce diseases in parts at a distance from those to which they are directly applied*, must be presumed to operate; and it is on this principle that many of the effects of heat and cold, of the numerous corruptions of the air, of various kinds of aliments, and of several poisons, have been already explained; and we shall have occasion to speak of the same agent in explaining that of some other exciting causes of disease, as well as of many remedies by which diseases are removed. At present, therefore, it will be sufficient merely to notice what seems more particularly adapted to this place, viz. the influence of sympathy, as far it regards the production of one disease from another.* Of this a familiar example is given in the production of orchitis in the male, or the inflammation of the mammæ in the female, from cynanche parotidea; another from inflammation of the eyes in gonorrhœa;† and a third in inflammation and other disorders of the stomach, from

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* [Endocarditis has been found to be constantly accompanied with a deposition of lymph on the superficial part of the spleen, and frequently also of the kidneys. (Rokitansky and Skoda. Vienna.)]—Editors.

† [An important consequence of gonorrhœa is the metastasis which sometimes takes place to the larynx, where it causes a catarrhal inflammation of the mucous membrane of the epiglottis and aryteno-epiglottidean folds and superior ligaments of the glottis, followed by degeneration of the mucous membrane and submucous cellular tissue, and contraction of the prima glottidis and cavity of the larynx. (Rokitansky, Handbuch der path. Anat. bd. iii. p. 20; and Schönlein's Allgemeine Pathologie, 1st theil. s. 114.)]—Editors.

diseases of the liver, kidney, uterus, and numerous other organs. It is said by Morgagni, Dr Ley, and others, that a similar sympathy displays itself between the uterus and spleen: this however is less certain.

It is remarkable, that in most of these instances the occurrence of the secondary disease takes place only or chiefly on the cessation or diminution of the primary one, when it is called metastasis; and this fact seems easily explained upon principles which have been all along inculcated, and which will be still more particularly insisted on as we proceed. It seems sufficient to observe here, that if the healthy function of any part consist in a certain degree of irritation, the diseased function of that part (such as inflammation of it) will imply a minor degree of irritation, and consequently a minor degree of sympathy, exercised by this organ upon all the rest of the body. Upon the cessation, therefore, or diminution of this disease (implying a renewal of the healthy irritation in the part), it will follow that this irritation is to be regarded almost as a preternatural one, and the sympathetic communication of it to other organs might almost have been anticipated. This explanation appears sufficiently applicable to all the instances of the communication of the disease by sympathy, which have just been mentioned; and if diseases of the parotid gland, liver, urethra, kidney, uterus, or rather a cessation or diminution of these diseases, may thus affect one or more organs at a distance, those of the stomach, between which and the rest of the body the most extensive sympathy prevails, will be communicated by this means to a greater number of organs than those of any other part. Accordingly, the sympathetic communication

of diseases of the stomach to distant organs has been noticed from the most ancient times. It has been already more than once observed, that one of the earliest dogmas in medicine was, that as all the four chief humours were formed primarily in the stomach, so all the supposed morbid matters, which were the exciting cause of all the diseases entering the body by this organ, were there converted into certain crude substances, which were carried to distant parts, and to concoct and expel which was the main object of diseases in general, and particularly inflammation; and how nearly this dogma corresponds with the doctrines of "the mucous membrane and digestive organ school" of pathology, is remarkable. If we substitute for the words *morbid matter* the term primary irritation, and for the words *crude substances* the term sympathy, the doctrines are essentially the same; the whole amounting merely to this, that a primary irritation of the stomach, being conveyed by sympathy to distant organs, excites in them numerous diseases; and it cannot but be very favourable to the doctrines of the supporters of the school in question, that the observation of all ages has thus tended to establish this dependence (whatever be its nature) of the affections of remote organs upon those of the stomach and its appendages.

The principal diseases having, at first sight, little or no connection with the stomach or intestines, but which, nevertheless, are now frequently referred to these organs as their primary seat (to enumerate them in the order in which they have been successively so referred), are scorbutus, insanity, diseases of the skin, rheumatism and gout, chorea, hydroce-

phalus, ophthalmia, fever in general, tetanus, sanguineous apoplexy, epilepsy and hysteria, scrophula and tabes.*

* That the spleen, for example, was the organ chiefly in fault in scorbutus, was one of the most ancient notions with respect to this disease; and this notion, although founded on the hypothetical principle of its either not accommodating or not clearing off sufficient black bile, abundantly well shews how intimately connected this disease was, in the minds of the earliest writers on medicine, with the disease of the digestive organs, among which the spleen has so long been reckoned; and how analogous this opinion of the origin of scorbutus is to that lately offered by Broussais, Marshall Hall, and many others, must be sufficiently apparent. The same thing may be observed with respect to insanity, which from the time of Melampus was continually referred to the spleen, as the terms melancholia, hypochondriasis, &c. sufficiently indicate; and though the etymology of mania is uncertain, its primary seat was supposed to be similar, as testified by Aretæus and many others. Virgil also speaks of a madman as one consumed "atro felle." Celsus applies the term, "atræ bilis morbus" to every variety of insanity. Ruffus remarks that the parts about the hypochondria are very generally first affected in this disease; and by the Arabians it is called mirachea, a term derived directly from mirach, the belly. It is singular how nearly these surmises coincide with the recent doctrines, with respect to insanity, of Weitbrecht, Pinel, Prost, Percival, and many others, all of whom, particularly Pinel, reiterate the opinion of the ancients, that the primary seat of insanity is almost always in the epigastric region; and that it is from this centre that it propagates itself, as Pinel says, by a kind of radiation. With respect also to diseases of the skin, Hippocrates and Aretæus seem everywhere to have regarded them, as is remarked by Alibert, in the light of a sequela of lesions of the prima via; and the same view has been recently taken of them in succession by De Haen, Baldinger, Stow, Withering, Abernethy, Broussais, Willan, and Bateman, on every page in the works of both of whom, the vague expressions of "connected with internal disorder," "connected with an irritable state of the alimentary canal," "connected with disorder of the stomach and bowels," "connected with derangement of the abdominal viscera," &c. are reiterated. The same fact has been insisted on also by Alibert, Harrison, Scouttetten, Andral, Goupil, and numerous other authors; Goupil

In conclusion of this subject it may be observed, that unquestionably the diseases just enumerated, as

in particular explicitly observing, that an inflammation of the digestive passages *always* precedes that of the skin; and how irritable the skin really becomes from any cause which disorders the stomach, must be familiar to every body who has shaved himself on the morning after a debauch. Similar notions with respect to the dependence of rheumatism and gout upon disorders of the stomach began to be entertained early in the seventeenth century by Van Helmont, and have been subsequently supported by Hoffmann and Darwin, and recently by Broussais, Sutton, Scudamore, and many others. The origin of chorea also from a diseased state of the stomach and bowels was noticed by Sydenham about the middle of this century, again by Stahl about 100 years afterwards, and in a still more remarkable manner lately by Hamilton. With respect to hydrocephalus, also, the great similarity between its early symptoms and those arising from intestinal worms was pointed out about the middle of last century by Fothergill; and that the origin of the former affection is commonly in the digestive organs, has been since that time distinctly shewn successively by Saunders, Hamilton, Abernethy, Cheyne, Curry, and particularly by Yeates. The epidemic ophthalmia, also, which visited London in 1774, was in like manner referred by Sims, who described it, to a disease of the stomach and bowels. About ten years afterwards appeared the Nosographie Philosophique of Pinel, in which the importance attached to the mucous membranes in general, and to that of the intestinal canal in particular, far exceeded what had hitherto been assigned to them; and again, about ten years afterwards, appeared the Anatomie Générale of Bichat, in which it is observed that this system of membranes, in a pathological point of view, ought to occupy a place equal to that of very many of the other tissues. The same thing was soon after insisted on by Prost; and it has lately been remarked by Roche and Sanson, that the diseases of these membranes constitute at least five-sixths of all the diseases which afflict human nature. It was soon after the first appearance of Pinel's work that an important influence was assigned to the stomach and bowels in the production of fever by John Hunter, and subsequently by Mr Abernethy; and how extensive an application has been made of this observation by Broussais and his followers is sufficiently well known. On this subject, however, we shall have to speak more fully in future. In the beginning of the present century the origin of tetanus from a diseased

well as numerous other diseases which it is unnecessary to specify, do frequently originate from sympathy with the stomach and bowels; but that we have no evidence that any one of them *always* does so, but, on the contrary, are justified in doubting whether what is thus frequently effected by one irritation, is not, sometimes at least, effected also by others. It is in this exclusive view of the subject, taken by the Broussaists, that they seem to have erred. Since the appearance of Broussais's works, every question with respect to diseases in general has been answered by some certain pathologists with the single word "gastro-enterite." This has been made to fit all diseases, as a barber's chair (to use a homely simile of Shakspere) fits all buttocks, "your pin buttock, your quatch buttock, your brawn buttock, or any buttock;" but it cannot be under the same *form* that it does all this; and if gastro-enteritis be, as is probably the case, thus widely different at different times from itself, it is certainly not unreasonable to suppose that other

state of the stomach and bowels was for the first time distinctly pointed out by Dr Hamilton, who has been supported in these views by Abernethy, Dixon, M'Arthur, and many others. It was Mr Abernethy also who about the same time distinctly traced sanguineous apoplexy, epilepsy, and hysteria to a similar cause, in all which he is supported by the Broussaists in general, and in this country by Marshall Hall and many others. In 1808 appeared the celebrated work of Broussais, in which a collective view was given of the dependence of most of the foregoing diseases upon an inflammation of the stomach and bowels; and to the list were added, among many others, scrophula and tabes mesenterica, that is to say, the inflammation producing the tubercles whence these diseases proceed; in which view he is supported in this country by Lloyd and many others. To the same source are referred, by Broussais, dyspepsia and chlorosis; and in these views he has been supported, with respect to dyspepsia, by Dr Parry, and with respect to both by Marshall Hall.

irritations, different from that which attends any form of gastro-enteritis, may sometimes produce each of the diseases which has been attributed solely to this. A knowledge of gastro-enteritis may be, as Broussais says, the key of pathology, but it does not constitute pathology, marrow, bones, and all, as some persons seem to imagine.

It belongs to the head of sympathy, as an exciting cause of disease, to notice that remarkable exemplification of it which presents itself in the occurrence of symptomatic fever from any considerable local inflammation; a fact with which we are all so familiar, that, being regarded as a thing of course, it almost ceases to attract any attention. And here, again, the same exclusive principle of reasoning has been frequently adopted as in the case of other diseases arising from affection of the stomach and bowels; and it has been concluded that, because fever very frequently arises from local inflammation, it necessarily always does so. The idea that fever (even in the form commonly called idiopathic) is universally symptomatic, is as old, if not as Diocles, the immediate successor of Hippocrates, at least as Erasistratus, who explicitly affirmed "*Febrem nullam sine hac esse.*" And by Aretæus, one species of idiopathic fever at least (that called by Hippocrates καυσος, which nearly corresponds to our synocha) was said always to depend upon an inflammation of the vena cava; a doctrine which, according to Haller, was prevalent even in his day. It is however sufficiently well known, that from the time of Hippocrates almost down to the beginning of the present century, fever has in general been treated as an idiopathic disease, and, as in its nature analogous to

local inflammation, so, like the latter, capable of arising directly from numerous exciting causes. It began, however, to be observed by Dr Fordyce and others, that in the fever commonly reputed idiopathic, every part of the body was very rarely affected in an equal degree; and it was remarked, among many similar testimonies, by Mr Burns, that typhus was always attended with an inflammatory affection of the heart, and sometimes of the lungs and abdominal viscera. Dr Rush, also, speaking of the fever of Philadelphia, says that it was always found at the weak part of every constitution which it attacked. Still, however, these local affections were commonly considered as the effect rather than the cause of fever; and it is perhaps to Beddoes and Clutterbuck that we owe the first explicit annunciation in modern times, that fever is not only sometimes, but always, the result of local inflammation, seated, according to the former, in the intestines, according to the latter, in the brain. The general doctrine of these pathologists was speedily supported by the celebrated Broussais, the appearance of whose work in 1808 formed almost a new era in the history of pathology. By this once popular French professor, every description of fever, whether idiopathic, or, as the French called it, essential, or attendant upon evident local inflammation, is referred directly to an inflammation of the mucous membrane of the stomach and small intestines, itself a consequence, in the case of confessedly symptomatic fever, of the primary inflammation; and in this view he is borne out by Hunter, who had long before observed that inflammation of any organ had a tendency to produce fever, in the direct ratio of the

connexion of this organ with the stomach, as well as by Mr Abernethy, who treads everywhere so closely in his footsteps, and who had abundantly shewn that all local disorders produced a proportionate derangement of the stomach and bowels. With Broussais, then, gastro-enteritis and inflammatory fever are entirely synonymous terms; but it seems to be everywhere more generally agreed upon, that local inflammation *somewhere or other* is the only exciting cause of fever, than that any individual organ is the seat of the inflammation. Thus, by Dr Milns it is referred always to some particular organ, not always to the same, but at one time to the lungs, at another to the stomach, liver, brain, &c., and the fever is called accordingly pulmonic, hepatic, cephalic, and so forth, being distinguished from the proper inflammation of these organs only by less urgency of the inflammatory symptoms. This view of the matter received general support, during the epidemic scourge of Great Britain and Ireland from 1815 to 1820, from Armstrong, Pritchard, Cheyne, Percival, Bateman, Miller, Graham, Duncan, Welsh, and a host of other writers.

It is sufficient for the present purpose if it be admitted that fever, at least *very frequently*, arises from local inflammation, and affords one of the best examples of sympathy as an exciting cause of disease. The other examples of this agent which might be adduced are almost infinitely numerous, and many of these we shall have occasion to allude to incidentally as we proceed.

With respect to the *passions* as an exciting cause of disease, this agent has already been spoken of as a general stimulus to irritability, and has been repre-

sented as differing from sympathy only in having its primary seat always in the brain, whereas that of sympathy may be in any part of the body. The distinct diseases frequently attributed to this cause are, in the brain, arachnitis and sanguineous apoplexy among the organic diseases; and incubus, somnambulism, insanity, idiotism, nervous apoplexy, and catalepsy among the functional; and in distant organs, among the simple inflammations, cynanche tonsillaris and gout; among increased secretions in general, biliary calculi, jaundice, diarrhœa, dysentery, and polysarcia; and among the hæmorrhages, hæmatemesis, hæmoptysis, mænorrhagia, epistaxis, scorbutus; and, lastly, among the functional diseases, angina pectoris, asthma, palpitation of the heart, syncope, dyspepsia, chlorosis, amaurosis, palsy of the tongue, epilepsy, and hysteria.

Of these, arachnitis or sanguineous apoplexy may arise from anger or fear; insanity from love, superstition, an ardent longing after something, and so forth; idiotism from terror; nervous apoplexy from intense grief, joy, or terror (the emotion here being more violent than that calculated to produce sanguineous apoplexy or arachnitis, as before explained); catalepsy from fear or affliction. The manner in which these several emotions operate in producing, in the organ in which they themselves are seated, the various affections (whether organic or functional) which are attributed to them, may be easily conceived. Of the diseases of the distant organs resulting from the passions, cynanche tonsillaris may arise from any considerable emotion (which is familiarly called a nervous sore throat), gout from anger or terror, biliary calculi and jaundice from fear or jealousy. Diarrhœa may be occasion-

ed, as every body knows, by disgust or dismay; polysarcia by perfect despair, no less than by continued hilarity; hæmoptysis and hæmatemesis from any strong emotion; epistaxis from anger; and scorbutus from continued depression. Lastly, angina pectoris, asthma, palpitation of the heart, and syncope, may result from any strong affection of the mind; dyspepsia and chlorosis from depressing passions in general; amaurosis from anger; palsy of the tongue from terror; epilepsy and hysteria from irritation, and various other affections of the mind.*

With respect to the manner in which these several

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* [The chief disease with which the criminals in the provincial penitentiary of Lower Austria are affected is tubercles, especially of the lungs, frequently also of the intestinal canal and spleen, and more rarely of the kidneys, liver, and brain. Out of thirty-six deaths in 1838, twenty were found on dissection to have tuberculous phthisis of the lungs, with more or less of tubercular disease of other organs in the above order. It does not occur only in those who have been long confined, but very often in those newly come, and who were quite healthy before their entrance, but who take their misfortune very much to heart, and are not to be comforted. If they have already the germ of this disease, on their entrance the phthisis makes the most rapid progress, and carries them off in a few weeks.

Criminals are most subject to these diseases immediately after their admission and immediately before their liberation. There are many examples where criminals have been attacked with dangerous diseases in the first days of their imprisonment; and again, those who have been in confinement for years without any important disease, have in the last weeks, or even days, of their imprisonment, become violently ill, and died a day or two before the expiration of their sentence.

The diseases are principally those of the lungs and heart.

Next to phthisis, the most frequent diseases are pleuritic and pericardial effusions. These affections Dr Haller has observed as yet only in males. (See Oesterreich. Med. Jahrbücher, vol. xx. p. 387.)]—EDITORS.

organic diseases above enumerated may be supposed to be produced by the passions, it is only necessary to repeat here, what has frequently before been said, that, taking inflammation as the head and front of them all, it is easy to conceive how any strong agent, either direct or indirect, may produce, at second hand, the dilatation of the capillary arteries in which this state consists; and with respect to the functional diseases, the difficulty is not much greater, as we have already endeavoured to shew when speaking of the action of poisons. On this head, however, it is impossible to be very clear, until we shall have examined the nature of the several functional diseases in question, which will be done under the head of Semiology.

The common arrangement of the passions into stimulant and sedative seems to be not only very ill founded, but without any practical utility, since, from what has been already said of the action of stimulants and sedatives in general, it will sufficiently appear that it is to the permanent effect only of any emotion that we are to look in regarding them as the exciting causes of disease, and that this might be the same from two passions, though their primary action were diametrically opposite. There can be little doubt, however, that all the passions, as positive agents, are directly stimulant; and if we can satisfactorily explain their influence in producing paleness or blushing on the one hand, or various gesticulations on the other, there will be little difficulty in applying the same explanation to their influence in producing any one of the diseases above mentioned. With respect to the vehicle by which not only sympathy, but the passions also (which in fact are merely a variety of

sympathy), are conveyed, the former from any organ of the body, the latter from the brain (which were respectively the primary seat of the irritation), so as to produce a secondary irritation in a distant organ, we endeavoured to render it probable, when speaking of these agents as general stimuli to irritability,* that they were conveyed by the respiratory system of nerves; and what was then said is equally applicable to conveyance of these stimuli as a cause of disease. It is probable therefore that, *cæteris paribus*, those organs will be most liable to be affected by the several passions, between which and the brain there is the closest connection by means of this system of nerves. But this is not the only circumstance to be regarded, since probably the nature of each individual passion has a much greater influence in affecting this or that organ, than the connection of the organ with the brain. Every organ has its own specific irritability, its own tendency to be affected by certain stimuli and no other; so that though every passion may be presumed to be extended, like every other primary irritation, such as that by poisons, &c., principally to those organs which are most closely connected, by means of the respiratory system of nerves, with the seat of the primary irritation, it does by no means follow that it shall display its chief effects there, but, on the contrary, may reasonably enough be supposed to be frequently quite inert with respect to these organs, while it effects very remarkable changes on others much less sensibly connected with the seat of the primary irritation.

* See Rudiments of Physiology.

CHAP. VI.

ACCIDENTAL STIMULI.

BLOOD-LETTING—HÆMORRHAGE—VENOMS—INOCULATION—EXPLANATION OF ITS ACTION—VACCINATION—[DURATION OF EFFECT OF VACCINATION—IDENTITY OF VARIOLA AND VACCINIA.]

All those exciting causes of disease have now been spoken of which are modifications merely of the common agents upon the irritability of the body in a state of health; it remains now to speak of those which are only accidentally applied to it. Of these, one of the chief heads includes *pressure*, *blows*, *wounds*, and *poisons*, applied directly to the skin; and the various affections which each of these may occasion, as well as their general mode of action, are sufficiently palpable. Among the numerous kinds of pressure may be mentioned certain peculiarities in the dress, such as tight stocks, which are said to be not unfrequently the cause of sanguineous apoplexy, as tight stays are of peripneumonia and consequent tubercles of the lungs, tight shoes, of corns, &c.; and the operation of all these is quite obvious. With respect to *wounds*, they may be in the form either of a puncture, or incision, or a laceration, as when inflicted by a bite, or they may be combined with contusion, as occurs in gunshot wounds. Their common consequence, besides the local injury, is, when the loss of blood is considerable, syncope; and when they are otherwise severe, trismus or tetanus.

It is perhaps under this head, more appropriately than under any other, that we may arrange copious blood-letting and hæmorrhage as causes of disease in general. The principal diseases apt to arise from these causes are, among the organic, fever in general, but especially the puerperal fever—dropsies in general, and in particular hydrocephalus; and among the functional, insanity, delirium tremens, epilepsy, amaurosis, and nervous apoplexy.

This, as a general cause of disease, has been investigated of late with particular care by Dr M. Hall; but its effects have been incidentally noticed by many previous authors. Thus, the instrumentality of copious hæmorrhage in producing puerperal fever was insisted on by White and Mannering, and its effects in occasioning dropsy have been observed from the earliest time. Good, also Abercrombie, M. Hall, and many others, have distinctly traced hydrocephalus to that cause; and it was proved many years ago by Kellie and Saunders, that by bleeding animals to death, they always produced a deposition of serum in their brain. That the insanity of puerperal women also often arises from the hæmorrhage which they have undergone, is proved by Good, M. Hall, and many others; and that a kind of delirium tremens, with constant watchfulness, has often (particularly in young persons) this origin, is well established; so also that epileptic convulsions often arise from this cause is abundantly well known, and perhaps this is not unfrequently the origin of those which so frequently occur during parturition.* In addition to

* One of the most common consequences of this exciting cause of

these, amaurosis has been observed to arise from this cause by Richter and Travers; and nervous apoplexy is as well-known a result of it in the old, as delirium tremens in the young. The explanation of all this is sufficiently easy. With respect to the organic diseases above mentioned, their essence—not less the dropsies than the fevers (as will in future be shewn)—is inflammation; and how readily inflammation is excited by a want, as well as by an excess, of any ordinary stimulus, is well known. If cold, then, can produce this state, we should *a priori* say that hæmorrhage may do so too. Nor with respect to the functional diseases is the difficulty greater. In the case of insanity it acts obviously on the vessels of the brain, so as to produce irregular circulation; and it is still through the brain also, in all probability, in the case of syncope, in which the heart principally suffers, in delirium tremens and nervous apoplexy, which involve both the mental faculties and the voluntary motions, and in that of epilepsy, which involves the latter only. "En privant," says Andral, and most truly, "le cerveau de ses excitants accoutumés, on peut produire précisément ces mêmes effets que ceux auquelles on donnerait lieu en augmentant la quantité de ses excitants."

The effects of the venom of insects, if inserted into the skin, are in general violent local inflammation, and if inserted into the mucous membranes, inflam-

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disease is a kind of chronic syncope, similar to what is called mercurial erethism, displaying itself chiefly in a remarkable susceptibility of any impression, and a tendency to syncope from the slightest causes. (Pearson, Cooke, &c.)

mation of the tongue, cynanche pharyngea, and so forth.* That of the aranea tarantula is said to produce also a kind of chorea, or irresistible propensity to dancing.

It belongs likewise to this place to enumerate the different specific viruses secreted, such as those of gonorrhœa, lues venerea, molluscum, vaccinia, porrigo, variola, scabies, frambæsia, hospital gangrene, and

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* The poisonous substances which act by direct contact with the skin, or the beginnings of the mucous membranes, include most of those which have been already spoken of as taking effect in general through the medium of the atmosphere, or when received into the stomach; their action, when applied to the skin, being first to abrade, or otherwise alter, the texture of the cuticle, so as to come at once in contact with the living tissues. But of the specific venoms, it appears that few are injurious, either as diffused through the air, as received into the stomach, or as applied directly to the sound skin, or the beginnings of mucous membranes, most of them requiring, in order to operate, that they should be inserted under the surface. Of this nature is the venom of the crotalus horridus, or rattlesnake of America, that of some kinds of boa, various species of coluber, or viper of Europe, as well as in innumerable insects, such as the wasp, bee, gnat, musquito, spider, and some few more. The affections resulting from the venoms of the reptiles above enumerated, when so inserted, are principally a violent inflammation of the subcutaneous cellular membrane in the neighbourhood of the injury and elsewhere, gastro-enteritis, arachnitis, jaundice, purpura, and pneumatosis, proving fatal ultimately by nervous apoplexy, by which all such venoms appear to prove fatal.

The bite of some serpents, as the coluber aspis, is said to produce the last effect alone, and that so mildly, that it was sometimes chosen as a means of self-destruction by those among the ancients who were epicureans even in suicide, as was the case with Cleopatra, who selected, as the means of her destruction, the "pretty worm of Nilus," "as sweet as balm, as soft as air, as gentle ——." The pain even of the bite of this animal is represented by Dioscorides, her physician, as not without pleasure; and similar representations are to be met with in all the ancient authors,—a kind of intoxication.

hydrophobia, all which produce, when inserted in this way, and some of them apparently when merely superficially applied either to the sound skin or to the openings of the mucous membranes, the same diseases by which they themselves were generated, as well as the peculiar viruses generated in some dead bodies, or rather perhaps secreted in some diseased bodies, which produce, when introduced into a wound, a violent inflammation of the subcutaneous cellular tissue. With respect to the mode of operation of all these agents, there is reason to believe, that in producing all the above-mentioned diseases, their action is that of specific stimuli, direct when they affect the parts to which they are immediately applied, and sympathetic when they act on parts at a distance. The doctrine, that in any one of these diseases a vitiation of the blood, by absorbed matter, forms any part of the exciting cause, is very exceptionable, and is liable to all the objections previously urged against the doctrine as regarded the operation of poisons.*

The period that may elapse after exposure to any one of these viruses before any sensible effects take place, *i. e.* the stage of excitement which precedes that of collapse, in which the disease essentially consists, is in different instances of the same disease, as well as in different diseases, extremely various. In those diseases however which arise as well from miasms as from inoculation, as variola, the latent stage, as it is called, is almost twice as long in the

* [Here the same arguments are repeated, almost word for word, as were used at p. 103 to refute the opinion of the primary vitiation of the blood in cases of poisoning.]—EDITORS.

former case as in the latter; and it is probably in this way, as has been before remarked, that we must explain the greater severity of the disease in the one case than in the other. This circumstance has been at different times referred, 1st. to the disease when produced by inoculation being forced upon the constitution *nolens volens*, as it were, while, when taken naturally, the system co-operated with it (Mead)—to this it may be replied, that there is no proof that the body resists the inoculated more than the natural variola; 2d. to the person being prepared by abstinence and medicine for the attack in the former case and not in the latter—in general he is not so prepared (Mead); 3d. to less of the poison being introduced in inoculation than in variola (Cullen)—we know nothing about the quantity; 4th. to a part of it being thrown off by the wound (Trallis)—the same objection as to the last; 5th. to a chief part of its force being spent upon the skin instead of more important organs (Tissot)—it acts equally on the skin in both cases, the other organs being only sympathetically affected; 6th. to its chief force being spent upon a small spot, instead of being generally diffused (Adams)—a small spot is enough in lues and hydrophobia; 7th. to the poison as modified, and as it were digested, by the skin, being milder, than as modified by other organs (Jenner)—this explanation is wholly unintelligible; 8th. to the same poison, when introduced by inoculation, being changed by its passage through the axillary glands (Monro). It seems quite unnecessary to waste time in showing how perfectly inadequate any one of these alleged causes is to explain the effect in question. The true explana-

tion seems to be, that in its concentrated state it produces so strong a contraction of the capillary arteries as is incompatible with a long continuance; and the subsequent relaxation in which the disease consists is in proportion to this continuance.

Many of the diseases above enumerated, and in particular variola, varicella, and frambæsia, occur only once, for the most part, during the life of an individual, which is perhaps to be attributed, as has been before remarked, to the destruction of the specific irritability of the organs affected by the previous occurrence of the disease. A similar destruction of this irritability is effected, in the case of variola, by the occurrence of vaccinia; a fact which can be explained only upon the presumption that by this means a specific irritation has been extended by sympathy from the vaccine vesicle through the whole dermoid tissue, although the effects of this are not such as to be evident to the senses; or, if we regard the affection of the skin in variola as merely symptomatic of a specific irritation of the mucous membrane of the stomach and bowels, we may conceive that the vaccine vesicle has effected some change in the susceptibility of these organs, analogous to that which we have just supposed produced in the dermoid tissue.*

* [As the question of the more or less perfect immunity, derived from vaccination, to the contagion of smallpox, is one which has of late excited much and deserving interest, we may here give the results of some experiments made on a very extensive scale in the Prussian army.

In that army, in the year 1838, the number vaccinated was 42,041, of whom 33,819 had distinct cicatrices, 5645 indistinct, and 2577 none at all. When all were re-vaccinated, in 19,117 the vac-

cinia ran its ordinary course, in 8672 it was irregular, and in 14,252 vaccination produced no effect. Vaccination was again tried upon those on whom before it had not taken effect, and 2306 were affected, and 10,424 were not. Of those who were vaccinated either in 1838 or previously with effect, 31 took the smallpox, either genuine or modified. In one case the vaccinia did not appear until six weeks after inoculation, and then with very severe local inflammation, from which a violent fever arose. In seven cases death followed, but it did not occur in any of those 31 who had been re-vaccinated, in all of whom the disease appeared in its mildest form. (On the Result of Re-vaccination in the Royal Prussian Army, by Dr Sohmeyer. Kleinert's Rep., Feb. 1840.)

This seems also the proper place to advert to some very interesting experiments, which tend to shew the identity of vaccinia and smallpox.

Dr Basil Thiele of Kasan (Russia) inoculated a cow with smallpox matter, and found that by so doing he could produce the true vaccinia, which was afterwards serviceable for vaccination. On the 3d day after the inoculation a hardness is perceived in the cellular tissue of the udder, on the 5th a vaccine-like pustule is formed, on the 7th and 9th this contains a clear lymph, from the 9th to the 11th it begins to dry and leaves a small superficial cicatrix. The matter so obtained can be either immediately employed, or kept for some time between glass.

Dr Thiele's first experiments were made in 1836, and successfully repeated in 1838: since that time the subject has been admirably examined in this country by Dr Ceely (Transactions of Medical and Surgical Association, vol. viii., or 1840), who has fully corroborated by his own experiments the observations of Dr Thiele, whose trials were not known in this country at the time Dr Ceely made his investigations, which makes the confirmation even more satisfactory. The subject had been previously investigated, however, by Dr Sonderland (Medical Gazette, Nov. 1831).

The fundamental identity of the two diseases is further illustrated by other experiments of Dr Thiele, which shew that by being subjected to a very simple process, the variolous can be converted into the vaccine matter. The lymph from smallpox must be kept for ten days between pieces of glass waxed together, and then diluted with warm cow-milk, after which it assumes the appearance of common vaccine matter. Vaccination with this produces large pustules, and the common vaccine fever appears twice; the first time between the 3d and 4th days, and again more severely between the 11th and

14th. The redness of the circumference is more marked than in ordinary vaccination, and sometimes very small pustules appear. The cicatrix is larger and deeper than common, and its margin is at times sharp. When the operation is successively repeated upon 10 different persons, inoculating one from the other, the pox becomes more and more like the vaccinia, until it is impossible to distinguish it. *If there be no consecutive fever*, the inoculation may be made from arm to arm without dilution with milk. If this rule be not attended to, then true smallpox appears. These observations are taken from experiments on about 3000 persons. (Zeitschrift für die Arznei-kunde, 19 Jahrgang erstes viertel-jahrheft 15 Bogen. Also Kleinert's Rep., Nov. 1839, p. 1.)]—Editors.

CHAP. VII.

EXCRETIONS, EXERCISE, AND SLEEP.

SUPPRESSED AND RETAINED SECRETIONS—POSTURE AND EXERCISE—DISTURBED SLEEP—[DISEASES INCOMPATIBLE WITH ONE ANOTHER—TYPHUS, PUERPERAL FEVER, CHOLERA, AND DYSENTERY—TUBERCLES, CHOLERA, DYSENTERY, CARCINOMA, SEROUS CYSTS, ANEURISM, HYPERTROPHY OF HEART, CURVATURE OF SPINE, DILATED BRONCHIA, AND DISEASES OF STOMACH—CANCER AND SEROUS CYSTS.]

Besides the exciting causes of disease which have already been enumerated, some others are commonly mentioned, such as peculiarities with respect to the *excretions*, *exercise*, and *sleep*, each of which will require a short notice in this place. With respect to excretions, as the immoderate discharge of these rather constitutes diseases than causes them, so a suppression of discharges may give rise to a great number of disorders. This suppression, however, may depend either upon the fluids in question not being secreted, or, although secreted, being retained; the former operating entirely upon the principle which has been already adopted in explaining vicarious discharge, viz. the preternatural irritation which this suppression implies being conveyed by sympathy to distant parts, and the latter either directly or by sympathy; the direct irritation which the retained matters occasion being in like manner conveyed to distant parts. Of diseases arising from the non-secretion of the natural fluids, we have examples perhaps in catarrh and other dis-

eases so commonly, but perhaps in general so falsely, attributed to suppressed perspiration; but more certainly in ophthalmia and sanguineous apoplexy, from a suppression of the mucilage from the nostrils, common to snuff-takers when they suddenly leave off the practice; in the numerous hæmorrhages and other diseases which usually result from a suppression of the menstrual discharge; and in the insanity sometimes resulting from the suppression either of this discharge or of the lochia. Of diseases arising directly from the retention of secreted fluids, we have examples in biliary, intestinal, and urinary calculi, from the suppression and consequent inspissation of the bile, stools, and urine; and in ranula, from that of the saliva. Other examples also of diseases from retained excretions occur in dysentery, hæmorrhois, prolapse of the anus, colic, &c. from the retention of the stools; in inflammation of the mammæ, from that of milk; and in the adipose tumours on the surface of the body, from that of the sebaceous matters. Lastly, of diseases arising sympathetically, not from the suppression, but from the retention, of secreted fluids, we have examples in the arachnitis, which occurs from the retention of urine, and in the catalepsy, insanity, tetanus, epilepsy, chorea, hysteria, &c. which so often result from a retention of the stools. In the latter cases, however, it is questionable whether the diseases in question do not arise from the perturbed state of the intestinal canal, of which the retention of the stools is merely a symptom, than from the retention itself, and whether therefore they are not referrible to the head of sympathy in general, or the conveyance of the disease of one organ to distant parts, than to the head now un-

der consideration. It is useless, however, to affect any remarkable precision on such subjects as these, where it is obviously unattainable.

Under the head of *exercise* as an exciting cause of diseases, may be mentioned continual speaking, singing, or blowing musical instruments, so frequently the cause of peripneumonia, hæmoptysis, the deposition of tubercles in the lungs, and so forth; irritations of the lungs, upon which depend the alternate actions of respiration, being inordinately increased by the interruption of the regularity with which this process is naturally conducted. Thus in all these actions, and indeed in exercise of most kinds, the expirations considerably preponderate over the inspirations; and this, within certain limits, is perhaps conducive to health, as favouring the passage of the arterialized blood to the heart. It is obvious, however, that we cannot occupy three or four times the period in expiring that we do in inspiring (and perhaps a great deal more than this), without a proportionately lengthened exposure of the lungs to the stimulus on which inspiration depends; and this preternatural stimulus, therefore, when too often, or for too long a time applied, particularly if the lungs are predisposed to disease, may easily be supposed capable of producing in them various disorders. Hence it is not difficult to understand why such exercises as these, when violent, should be almost always prejudicial to persons of phthisical habit, although there are not wanting instances where a prudent employment of them has seemed rather to obviate than to produce phthisis, as moderate exercise of all kinds rather invigorates than weakens every organ of the body.

The same diseases may be produced by straining at stool, or violent efforts of any kind, which always require, as before observed, that the breath be retained; and in addition to these, violent exercise may excite hæmorrhage in general, and in particular sanguineous apoplexy, aneurism of either the arteries or the heart, various kinds of hernia, rheumatism, fractures, dislocations, among the organic diseases; and among the functional, angina pectoris, palpitation of the heart, and some few more, the explanation of all which must be sufficiently obvious. With respect to particular postures and kinds of exercise as productive of particular diseases, the effect of a long-continued erect posture in producing varix of the great saphena vein, as well as syncope,—of continued stooping of the head, as in some occupations, in producing sanguineous apoplexy, and of the trunk of the body, as in writing and several manufactures, in producing tubercles of the lungs (by impeding respiration) and distortion of the vertebræ,—of lying on the back, in producing incubus and somnambulism (by impeding the passage of blood from the lungs),—of frequent flexion and extension of the leg (as in riding), in producing aneurism of the popliteal artery,—and, lastly, excessively rapid motion of the whole body, in producing nervous apoplexy (by the strong impression made upon the nerves),—will be all easily understood upon the principles which have been here continually inculcated.

Too little exercise operates as a cause of disease, like too little heat or food, in the manner of a negative stimulus, and in this way gives rise to scorbutus, dyspepsia, and chlorosis.

From this cause also not unfrequently result chronic hepatitis, and consequent biliary calculi, and jaundice; an effect which will be easily understood if we remember that by too little exercise the function of the lungs is diminished, and that of the liver proportionately increased.

With respect to sleep, the too sparing indulgence in this state, or, in other words, the too long-continued exercise of the animal functions (sensation, thought, and voluntary motion), which are all intended to be at certain intervals intermitted, may operate in exciting ophthalmia, arachnitis, and insanity, in a manner which may be very easily conceived.

On the contrary, too great indulgence in sleep, in other words, the too sparing exercise of these functions, tends to excite encephalitis, sanguineous apoplexy, polysarcia (the former perhaps because the quantity of blood in the white matter is always inversely as that in the gray; the latter because the secretion of fat is, of all the secretions, the only one that is more copious in this state than during the waking hours). The frequent occurrence of asthma during sleep seems to arise partly from the horizontal posture being less favourable to the action of the respiratory muscles, partly from these muscles wanting now the continual stimulus derived from the brain, as well as that occasionally called into action by the will, by which, during the waking hours, an attack might have been prevented. The more frequent occurrence of epilepsy, hysteria, &c. (consisting in convulsions of the muscles of voluntary motion), immediately on awakening, is explicable from the principle

of the new and inordinate excitement under these circumstances, and of that irritation on which the voluntary motions (as one of the animal functions) depend, and which, when a person has been some time awake, is called into action only or chiefly by the will. With respect to incubus and somnambulism, these diseases are not excited by sleep, but consist in an imperfect degree of this state, produced generally by strong mental emotions, intense fatigue, lying on the back, eating a heavy supper, &c.: the irritation attending any one of these is incompatible with that degree of quiescence of the animal functions in which profound sleep consists.

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* [Before entering on the subject of proximate causes, it may be right to notice some investigations regarding the power of certain diseases to arrest the progress of, and in some cases wholly to destroy, certain others; and though this place may not seem exactly appropriate for these observations, yet we trust that the importance of the subject, as exhibiting how nature sometimes effects a cure of what are considered incurable diseases, and thus perhaps affording some hint which may be ultimately available for therapeutics, may be held as sufficient apology for introducing them here.

From the earliest times a vague idea has prevailed, that two diseases could not co-exist in the system. This opinion was thus far modified by John Hunter, who says that "no two actions from two

* What follows has been added by the Editors.

different morbid poisons can go on together at the same time in the same part or the same constitution." Later observations, while they have shewn this statement, as expressing a general law, to be erroneous, have at the same time indicated that certain diseases exert upon others an opposing influence, in the way of the one arresting the course or modifying the nature of the other. For example, measles and smallpox have been observed to suspend, or otherwise modify, the course of each other, by Pinel,* Willan, Bateman, De Haen, Vogel, Horn, and M'Bride.† Hooping-cough sometimes suspends an attack of smallpox, measles, and scarlet fever.‡ Hooping-cough is frequently cured by vaccination.§ It is sometimes also cured by smallpox and measles.|| Vaccinia may suspend, or in its turn be suspended by, scarlatina. The plague was arrested by the prevalence of smallpox, but broke out again on its disappearance, according to Baron Larrey.¶

It has been also observed that some diseases appeared to give immunity to others, as, for example, according to the last-named author, those affected with the scurvy, and those affected with syphilis, were never attacked by the plague when it prevailed where they were. But these and other isolated facts are not of a sufficiently definite character to have attracted much attention, and it remained for Professor Rokitansky, whose unequalled opportu-

* Nosographie Philosophique, vol. ii. p. 51.
† See Williams's Elements of Med. vol. i. p. 171.
‡ Bateman's Diseases of London, p. 91.
§ Adams; Williams, op. cit. p. 304.
|| Okes, Med. Journ. vol. viii. p. 426.
¶ Déscript. d'Egypt.

nities of observation, and acknowledged accuracy, create the most perfect confidence in his investigations, to put this matter wholly in a new light, by establishing, from an amount of cases that renders fallacy in the result almost impossible, that certain diseases never co-exist, as the presence of the one arrests the progress, or prevents the occurrence, of the other. We subjoin a sketch of the observations upon which his conclusions are based.

Typhus and *puerperal fever.*

The typhus abdominalis,* *i. e.* with formation of the characteristic typhous matter, and which by Rokitansky is always understood under the name of typhus, is excluded by the various forms of puerperal fever. In 200 dissections of puerperal fever he did not find one complication of the typhous process. This immunity from typhus is given by the pregnant state, child-bed, and even, though in a less degree, by suckling. In a very large number of cases, only three of ilio-typhus occurred in the puerperal state. In suckling women the immunity is less, and diminishes still more at the end of the usual involution period of the uterus, *i. e.* about the sixth or seventh week after delivery.

Typhus and *cholera.*

Before the breaking out of the great cholera epidemics in Vienna, especially that of 1831, typhus fever prevailed to a most unusual extent; but it was observed that as the cholera approached, the formation of the typhous matter was gradually diminished, while the fever ran a very tedious course, attended with copious sweats and protracted comatose symptoms; and the formation

* Vide article Typhus, in the subsequent part of this work.

of the typhous matter in the mucous membrane of the intestinal canal was gradually diminished. There was only a trifling amount of typhous deposit in the mucous and submucous cellular tissue, along with numerous small extravasations. This deposit remained either in its crude state, or, instead of being rapidly softened and thrown off, was partially re-absorbed, or the whole process was confined to a congested state of the vessels of the mucous membrane, a venous stagnation in the mesenteric glands and other parts, and a copious secretion of a yellow gelatinous fluid from the inner surface of the mucous membrane, indicating that the disease was cut short in its congestive stage. When such was the character of the *genius epidemicus*, the cholera made its appearance, and the typhus abdominalis ceased altogether, or appeared only in rare and isolated cases of the above-mentioned character. Notwithstanding the apparent affinity of the two diseases, the true cholera never associated itself with the typhus; and still less was there a process developed out of the two which could be called typhoid. The so-called cholera-typhus, as is well known, had no essential resemblance to the proper typhus.

Typhus, *dysentery*, and *cholera*.

Although, during the prevalence of typhus, occasional cases of dysentery have occurred, and *vice versa*, yet Rokitansky has never seen, in an individual affected with typhus, the slightest trace of the dysenteric process; and as the changes in the intestinal mucous membrane in dysentery never bear the least resemblance to those in the same part in typhus, he concludes that these two diseases have the power of mutual exclusion. On the other hand, he has met with many examples of dysentery in cases of cholera ;

and also has occasionally found, in patients who have died in the stage of re-action of cholera, dysenteric softening of the mucous membrane, and abrasion of the epithelium in the end of the small and in the large intestines.

Tuberculosis (i. e. tubercular disease), and *cholera.*

In the cholera epidemics in Vienna, it was remarked that, in the very numerous dissections which were made, no case of cholera was found combined with tuberculosis; those isolated cases being fairly excepted where the disease being already in the colliquative stage, the discharge took on the character of cholera, and accelerated the death of the patient by exhaustion; and even in those cases when the symptoms indicated tubercles, the dissection shewed only appearances produced by chronic bronchitis, and at most calcareous or tendinous deposition at the apex of the lung, the result of extinguished tuberculous action. Although thus tuberculosis seemed incompatible with cholera, yet observations afforded no ground for believing that diseases of the lungs in general afforded any immunity from that disease: on the contrary, the pre-existence of various forms of disease of the larynx and bronchia was demonstrated on dissection in numerous cases of death by cholera.*

Tuberculosis and *typhus.*

The co-existence of tubercle and typhus is extremely rare, and in cases where it does occur, the tuberculous action is usually found completely extinguished.

Moreover, 1st. When tubercles are met with, it is in their retrograde stage.

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* It was also observed in Berlin, Königsberg, and Dantzig, that phthisical patients were very seldom attacked with cholera during its prevalence in these places. (Allgemeine Cholera-zeitung.)

2d. In those extremely rare cases in which typhus occurs, along with miliary tubercle in the lungs, the typhous process seems to be repressed in the intestinal mucous membrane, and directed towards the lungs, and under its influence the tubercles there are rapidly hurried into softening. When typhus occurs in a case of slightly developed tubercles, very far from giving it a favourable turn, it rather hastens the fatal issue.

3d. In the intestines, likewise, when the typhous meets the tuberculous process, the former hurries the tubercle on to rapid softening; and in this case the form of the ulcer is determined by the typhous; but it may also happen that both characteristic forms of ulcer occur together.*

4th. On the occurrence of typhus, the pre-existing bronchial catarrh which attends tuberculous vomicæ takes on the typhous character, spreads over all the ramifications of the bronchia, and brings on rapid softening of their mucous membrane.†

Tuberculosis and *dysentery*.

A similar relation between dysentery and tubercle is also observed; for true dysentery very rarely occurs along with tubercles of the lungs, and never along with tubercles of the abdomen. This is the more re-

* The tuberculous ulcer has a perfectly regular, circumscribed margin, and when healed, presents a contracting cicatrix; while the typhous has an irregular margin, and leaves a smooth cicatrix.

† Here Rokitansky cautions against confounding with typhus a disease whose symptoms and course bear a close resemblance to it, but which is as yet but little known, viz. acute tuberculosis. (See Note on Tubercle, in a subsequent part.)

It must not be supposed, from the above statement, that typhus gives any permanent exemption from tuberculosis; for a person that has had typhus, may at any time afterwards be attacked with tubercles. (Skoda and Kolletschka.)

markable, when we consider the tendency of dysentery to combine with scirrhus, and especially open cancer.

Tuberculosis and *carcinoma.*

In a series of 340 cases of cancer in its various forms, Rokitansky found that it by far the most frequently occurred in subjects which presented not the slightest trace of ever having at any time been affected with tuberculosis. It often occurred, however, in cases where long previously extinguished tuberculous action was found. But the cases in which the two morbid products existed simultaneously in the same individual, much more in the same organ, were extremely rare; and when this did happen, the cancerous process (commonly subsequently developed) occurred either when the tuberculosis was in a state of spontaneous retrogression, or checked the progress of the tubercle, so that it remained stationary in the stage of development in which it was; and the more the cancer spread, the more the tubercle passed into the stage of retrograde metamorphosis. Hence Rokitansky concludes, that the states of nutrition which produce carcinoma and tubercle are mutually incompatible, and the progress of either process is arrested by the other, and therefore they must be essentially opposed in their nature.* On the other hand, both these processes may perfectly well occur successively in the same individual, or even in the same organ, provided the one be wholly terminated before the occurrence of the other. Further, cancer readily admits the co-existence of an acute morbid process, which occurs only very rarely in any form, and never fully

* The heterogeneous nature of the two processes further shews itself in this, that the frequency of the occurrence of one in the organs or tissues bears an inverse ratio to that of the other.

developed along with tuberculosis, viz. *dysentery*, a complication so common both with primary and secondary cancerous ulcers.

Tuberculosis, and all kinds of *serous cysts*.

These processes are never met with simultaneously in the same organ, or even in the same individual; but when the one process has entirely ceased, the other may develope itself, and the formation of cysts very much more frequently follows the extinction of tubercles than *vice versa*. This is opposed to the views of Baron, Kühn, and Carmichael, who describe tubercle as arising from a transmuted hydatid vesicle. Sebastian corroborates Rokitansky's views of the subject, by observing that hydatids are never found in the human species in the same organ as tubercle. Cruveilhier however mentions having met with hydatids and tubercle in different parts of the same lung.*

Tuberculosis and *aneurism*.

In 108 cases of aneurism, Rokitansky has only seen five cases of tuberculosis, and in these the tubercles were confined to a very small portion of the lungs, and in their stage of retrogression: from this we learn that the two processes are incompatible with one another.†

Although these observations were made chiefly in cases of aneurism of the ascending aorta, yet in the number there were also aneurisms of the brachial, crural, thyroid, hepatic, gastric, epiploic, and splenic arteries.

This observation directs our attention also to the

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* See article Acephalocystes, in Dict. de Méd. et de Chirurg.

† [The average number of deaths in Vienna from tubercular consumption is one *third* of the whole population, although many more probably are affected with tubercle: at this average 36 out of the 108 cases of aneurism should have shewn traces of tuberculous depositions.]

close connection of the cancerous and aneurismatic diathesis.

Rokitansky, as well as others, has remarked, that the development of tubercle is arrested, although the disease is not subdued, by the pregnant state, as likewise by all large tumours in the abdomen.

Tuberculosis and *hypertrophy of the heart.*

In a series of 143 cases of all the different kinds of hypertrophy of the heart, Rokitansky did not once meet with tubercle in an active state, and only fifteen presented traces of long completely extinguished tuberculosis of the lungs. From this he concludes that the two morbid processes are incompatible with each other, so that tubercle cannot be developed when hypertrophy of the heart is present, although a slight degree of hypertrophy, especially of the right side of the heart, may occur in the latter stages of tuberculosis, from the obstruction which the blood meets with in its passage through the lungs.

Tuberculosis and *curvature of the spine.*

Tuberculosis, especially of the lungs, seems never to occur along with curvature of the spine. Among fifty cases, only three could be considered exceptions to this rule, and in these the curvature was very trifling, and the existence of the tuberculosis questionable. This is the more remarkable, since all the causes which originate the fundamental conditions of these deformities are exactly those causes which are favourable to the development of tubercle, such as confined posture, &c.; besides, many of the deformities in question are secondary and remote consequences of a process which, far from being able to exclude, rather favours the development of tubercle; but as this secondary process (viz. curvature) be-

comes pronounced, the tuberculous one is gradually repressed, and finally extinguished.

This remark is corroborated by the frequent observation of completely extinguished tubercles in the lungs in persons with curved spine, and still more by the remarkable fact, that in the kyphosis caused by the scrophulous carious destruction of the vertebræ, the diathesis favourable to the generation of tubercles becomes entirely and permanently annihilated.

From the analogy of the effects of cyanosis, hypertrophy of the heart, curvature of the spine, and pregnancy, in giving rise to a predominating venosity of the blood, while they differ from each other in almost every other respect, Rokitansky is inclined to ascribe to this venosity the incompatibility with tuberculosis displayed by the above-mentioned conditions.

Tuberculosis and *dilated bronchia.*

When the dilatation of the bronchiæ has reached a considerable extent, it brings on, in consequence of the wasting of a large portion of the respiratory organ, active dilatation of the right side of the heart, stagnation and dilatation of the whole venous system, and cyanosis; and in consequence, gives quite a remarkable immunity, not only from tubercles of the lungs, but from tuberculosis in general. Similar changes are the effects of emphysema of the lungs, and this is the cause of the exemption from tubercles usually displayed by asthmatics.*

Tuberculosis and diseases of the *stomach.*

Lastly, Rokitansky observes, that almost all chronic diseases of the stomach, such as formation of scirrhus and ulcers, are incompatible with tubercle.

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* Rokitansky's Handbuch der Pat. Anat. bd. iii.

In forty-four cases of these diseases, only four were found affected with tubercles, and in two of these the perforating ulcer was healed, and the disease extinguished. The rarity of the combination in question is further shewn in the frequency with which ulceration of the stomach is complicated with dysentery and Asiatic cholera, diseases which, we have seen, never occur in combination with tubercle.

Cancer and *serous cysts.*

The formation of serous cysts may co-exist with all kinds of cancerous degeneration, and it appears in different degrees combined with carcinoma *fibrosus, alveolaris,* and especially with carcinoma *medullaris,* which would seem to indicate an intimate relationship between the two processes.

Among many cases illustrative of this remark, there are two particularly mentioned by Rokitansky: the one where a large tumour was found occupying the pelvis of a child, consisting partly of medullary sarcoma, partly of alveolar cancer, and partly of serous cysts; the other where, after the amputation of a cancerous penis, a number of hydatids, some reaching the size of a pea, were developed in the bones of the pelvis.

The rarity of diseases of the genital organs in those who suffer from curvature of the spine (more particularly the immunity of the female sex from malignant parasitical growths), has forced itself on the observation of Rokitansky. This he refers to the condition of the body becoming the same as it is temporarily in pregnancy, in which state these diseases are never known to occur.]*

* See Oesterreich. Med. Jahrbücher, 1838.

CHAP. VIII.

PROXIMATE CAUSE.

A PROXIMATE CAUSE BOTH ORGANIC AND FUNCTIONAL—INFLAMMATION—DETERMINATION OF BLOOD—THEORIES OF INFLAMMATION—[RETARDATION AND STAGNATION OF BLOOD, AND DILATATION OF VESSELS—ACCELERATION OF CIRCULATION—CONSTRICTION OF VESSELS—CHANGES IN THE BLOOD—PULSATION PRODUCED BY CONSTRICTION—ELECTRIC THEORY—SUMMARY OF EXPERIMENTS.]

We now come to consider the *proximate causes* of disease, produced, it will be remembered, by the united operation of the predisposing and exciting causes, and, thus produced, immediately giving rise to the disease. A proximate cause consists, as has been already said, of some change either of organization or function in some part of the body. But it is proper to keep in mind that this ground of distinction, although commonly received as a sufficiently evident one, and as forming a useful general classification of diseases, is not logically precise, and has in consequence given rise to much unprofitable controversy. A function has been already defined to be the proper *action* of a living organ or set of organs, resulting from the influence of certain stimuli upon susceptibilities, which susceptibilities are properly resident in some certain parts of the nervous system alone, and are the necessary results of its organization. Now it is obvious that an exciting cause of diseases (whatever be their nature) can act only on those tissues of the body which are susceptible of their operation, in other words,

on the nervous system alone, and that the necessary result must be some change of function. Hence it has been a favourite dogma with some pathologists, that the proximate cause of every disease, or at least the first link of the chain which constitutes the proximate cause, not only resides in the nervous system alone, but is exclusively functional. But, on the other hand, the susceptibility in the nervous system of being acted on by such exciting causes depends upon its organization, which is changed correspondingly with the operation of any inordinate stimulus; so that in this view, adopted by other pathologists, the proximate cause of every disease, or at least its first link, is exclusively organic. The fact, however, appears to be, that under the operation of every exciting cause of disease there is a simultaneous change both of organization and of function, and that therefore every proximate cause is necessarily both organic and functional, and not exclusively either the one or the other. Nevertheless, as in some diseases the change of organization is sufficiently evident, while that of function is more or less obscure, so in others the change of function is the chief thing noticed, while that of organization for the most part eludes observation; and it is as employed to signify either the former or the latter of these classes of proximate causes, that the terms organic and functional are, with sufficient accuracy, employed. It is worse than useless to aim at higher precision in this matter, which serves only to render obscure what in a common sense view of the matter is sufficiently intelligible. This distinction above adopted is a very ancient one, although, as employed by the earlier writers, the term organic was

confined to affections of *entire organs*, while that of functional ones was made to include those of the *tissues* of which these *organs* were composed. Still it entirely corresponds with the definitions given above, since, while the affection of entire organs was supposed to be always attended with some change of structure, those of the tissues were supposed to consist in some change in their essential qualities alone, without any change of structure. The including diseases of the tissues in general, as well as those of the organs, under the common name of organic, and confining functional diseases to the nervous system, and the legitimate application of the doctrine of the tissues, founded upon the well-known principle which has introduced so much unwonted precision into modern pathology, that parts of a similar structure are alone liable to similar diseases, is entirely the work of the moderns, and chiefly of John Hunter, Dr C. Smith, Pinel, and Bichat, who, though far from being the first to describe the tissues, were among the first to render the knowledge of them of practical advantage. We shall consider, first, the organic, and afterwards the functional proximate causes of disease.

Of all organic proximate causes of disease, by far the most important and frequent is *inflammation*. This morbid change consists evidently in a preternatural dilatation by blood of the capillary arteries, veins, and lymphiferous and chyliferous vessels, constituting the parenchymatous tissue of a certain part, produced by either, first an increased and afterwards a diminished action of the vessels, or first a diminished, afterwards an increased, and again a diminished action, according as the exciting cause has been

either positive and stimulant, or negative and sedative, the blood becoming accumulated in them, not because they contribute less to its propulsion (for their action in this way is perhaps unnecessary), but because they are less able to resist the impulse with which it reaches them, and their calibre therefore becomes increased. They probably transmit neither more nor less blood than in a state of health; but, owing to the increase of calibre, it of course traverses the vessels with less than its accustomed velocity. But of this hereafter. The alternating action of the capillary vessels, as produced by either positive or negative exciting causes, has already been considered sufficiently fully when describing the action of heat and cold in the production of diseases in general; and that the effect of these, however excited, would be to give rise to all the phenomena of inflammation, might *a priori* have been expected. Still there is no subject in medicine on which more diversity of opinion has been at various times entertained, than on the nature of inflammation; and as there is none on which old prejudices still exert a more baneful influence than on this, it is proper to give a hasty sketch of the principal opinions which have been held concerning it.

It has been already remarked, that, by the *humoral pathologists*, organic diseases in general, and of course inflammation, were attributed to an akrasia or intemperies, consisting in an inordinate flow to certain organs of one or other of the four principal fluids of the body; that of the blood producing the phlegmenous inflammation; that of the yellow bile, the erythematic, or, as they called it, the erysipelatous; that of the black bile, the scirrhous; and that of the phlegm,

the leucophlegmatic or œdematous, an affection *now* known to be not of itself inflammatory, although a frequent consequence of inflammation.

The object of this influx was supposed to be in this case to promote the concoction and subsequent expulsion of certain crude morbific matters imagined to be there collected, and against which, as against an invading power, the said fluid was detached in battle array. Hence arose the well-known axiom, "ubi irritatio, ibi fluxus," an axiom still too frequently insisted on, and the source apparently of all the prejudices still so common with respect to *determination* of blood, which has been elsewhere treated of at sufficient length. To this doctrine was opposed that of *Erasistratus*, that inflammation in general depended upon the transfusion of blood into the arteries (which were by him considered to be adapted for the reception of air alone), as well as that of the methodic school of pathologists, who represented inflammation as consisting in the blocking up in certain parts of the insensible pores by insensible corpuscules; but the old humoral doctrines, modified by the dreams of the Arabians, and the ravings of Paracelsus and the earlier chemists, about acids and alkalies, effervescences and fermentations, still continued prevalent down to about our own times. All was hitherto referred to the fluids, which were either represented as flowing about hither and thither, nobody knows by what power, or in various ways vitiated, nobody knows by what means. At length Stahl (following Van Helmont, and followed in his turn by De Görter), taking into account the action of the anima, represented inflammation as arising from an increased

contraction of the capillary arteries, excited by this anima, so that an inordinate supply of blood was forced into the vessels leading immediately from them; while by Hoffman and Cullen this supposed contraction of the capillary arteries was said to amount rather to a perfect spasm, which spasm could not, while it continued (and they unfortunately omitted to make it relax), fill the vessels beyond them, and was imagined to operate by turning the column of blood into a kind of wedge in the capillary arteries, and at the same time to overload the larger branches, and thus effect an increased action in the course of them. This theory Cullen adopted in preference to the *eclectic doctrines* of Boerhaave, who had just before tried to reconcile the theories of the ancients with the modern principles, and who in this attempt to do so had called into play two new agents, viz. a supposed preternatural spissitude of the blood, indicated, as he thought, by its buffy coat, with a consequent lentor, or disposition to stagnate, produced by a loss of its thinner particles, and a supposed error loci, as it was called, or passage of some of the larger particles of the blood into vessels destined to receive the smaller alone,—a notion not many removes from that of Erasistratus.

Cullen's opinions for a long time were almost universal. All was now referred to the state of the vessels, as it had been before to that of the fluids. Even John Hunter, who could not conceive how the increased contraction of the vessels could overload them with blood, would not give up the said increased action, which, he very unwarrantably assumed, consisted in an increased dilatation, owing to excess of

elasticity. It is astonishing how men will cling to a preconceived opinion, in spite of every evidence of its fallacy; and how persons to this day will still persist in speaking about increased action of some kind or other as constituting the essence of inflammation. They cannot or will not perceive that the question is not, what is the state of the rest of the body when any considerable part is affected with inflammation, but what is the state of the vessels immediately affected.

In the mean time, however, Vacca Berlinghieri,* supported subsequently by the general tenets of Brown already mentioned, and more particularly by Dr Lubbock, and Mr Allen (in the Medical Society of Edinburgh, 1790), had inculcated the simple and satisfactory theory directly opposed to that of Cullen, that the dilatation of the capillary arteries in inflammation (always understanding by this term its second or more permanent and obvious stage) was to be ascribed to their *diminished* action, and a consequent accumulation of blood in them, not from the preponderance in them of elasticity, as so unnecessarily and gratuitously assumed by Hunter (the supposed tendency of which was not to diminish, but to increase, their calibre), nor from an increased fluxus of fluids in general, in the old phrase, or an inordinate determination of blood, as pathologists among ourselves still express themselves, but as the natural and immediate result of their increased calibre. This view of the matter was in 1824 ably supported by Dr W. Philip, who, by a series of well-conducted experiments

* De Inflammationis Morbosæ quæ in Humano Corpore fit, naturâ, causis, effectibus, et curatione, 1765.

tish pathologists; and those of the German, French, and Italian schools are, like our own, merely modifications of Brownonism, adulterated, it is true, with a good deal of the leaven of the fluxus of the determination school; the French, in particular, generally representing the dilatation of the capillary arteries as the result of an influx of blood, rather than the influx of blood as the result of the dilatation of these arteries; while, aware that such an influx cannot be ascribed to any of the commonly recognised powers of circulation, they are content to refer it to a sort of attraction exercised by the inflamed vessels. This doctrine, equally preposterous and uncalled for, has been recently supported among ourselves by Dr Pring, who ascribes inflammation to a kind of attraction exercised by the capillary arteries upon the blood in the larger vessels leading to them; a doctrine which is merely a modification of the exploded notions of John Hunter, since, if it be not by an active dilatation of these arteries, we can form no notion of any description of attraction which they can possess.*

* [The immense importance of the subject of inflammation, which may be looked on as the corner-stone of the whole system of pathology, renders it advisable, as we think, to enter more in detail into the evidence derived from experiments made regarding it. We do not therefore scruple to relate, even at the risk of repetition, numerous experiments, from which it will be seen that, how various soever the opinions of experimenters were, yet the results wonderfully harmonize with one another, and all tend to confirm the main conclusions which Dr Fletcher has arrived at in the text. In the numerous experiments which have been performed under the microscope, to ascertain the effect of stimuli applied to the transparent parts both of warm and cold blooded animals, and in the changes observed to occur in wounds as the most constant and well-marked result, we must first notice the *retardution* and final *stagnation* of the blood, and *dilatation* of the

vessels. This was observed by Leeuwenhoeck without his recognising it as inflammation. The experiments related by Spallanzani (Exp. 27, 32) exhibit a similar state of the vessels in wounds. Haller made corresponding observations in wounds in the experiments related in his Physiologia, tom. i. (Exp. 65, 69, 72). But the following experiments will be found to afford more direct evidence in favour of the statement.

Wedemeyer (über den Kreislauf des Blutes), in his experiments on the capillaries with galvanism, observes, there always followed more or less quickly, generally within the space of a minute, a remarkable *retardation* of the circulation of the blood through them, which went on rapidly to complete *stagnation;* the capillary vessels appeared *dilated*, and if they were before transparent and colourless, they now presented a red and inflamed appearance (p. 245). And again, caustic ammonia caused almost always a gradual *dilatation* of the arterial and venous capillaries; the blood flowed slower, and at last *stagnated.*

Gruithuisen, in his Organozoonomia (München, 1811, preface, p. 6), observes, as soon as the exciting causes of inflammation are applied, a *stagnation* of the circulation in the spot takes place in most of the capillary vessels which carry red blood.

Burdach (Observationes nonnullæ microscopicæ inflammationem spectantes, Regiom. 1824) directed the concentrated rays of the sun, by means of a lens, upon different parts of the mesentery, and observed *dilatation* of the capillaries and *retardation* of the blood without any previous contraction of the vessels: in from 10 to 15 minutes the circulation resumed its natural condition (Exp. 5). The application of a drop of the tincture of cantharides to the mesentery produced rapidly *stagnation* of the blood, and the greatest *dilatation* of the capillaries.

C. Koch (in J. Meckel's Archiv für Anatomie und Physiologie, 1832) found a small frog which had happened to have lost a forefoot some time before: the stump to the naked eye appeared red and inflamed, and when examined through the microscope, the capillaries were seen dilated, the blood in a stagnant state, and the globules dissolved in the serum; and in the 120 experiments suggested by the above observation, in which he wounded the web, the same results were observed. This shows that in true inflammation the blood often stagnates completely, and that this stagnation does not indicate gangrene, as Hastings, Kaltenbrunner, and others, seem to suppose. It also contradicts Thomson's opinion, that active inflammation is accompanied by increased, and passive by diminished velocity of the circulation. Further, in about 150 experiments, in which dilatation

of the vessels and stagnation and solution of the globules had been brought about by muriate of soda, the part returned to its natural condition after 24 hours of rest, on the application of cold water (p. 188).

It were easy to multiply almost infinitely examples where this stagnation and dilatation were observed, as it was a later result of every experiment upon the subject. We shall now detail a few experiments where this stagnation was preceded by *acceleration* of the circulation.

In addition to those mentioned in the text, we may give the following. Before doing so, however, it is right to mention that a slight discrepancy occurred in the experiments of Dr Thomson, and also perhaps in those of Kaltenbrunner. Dr Thomson found, that the dilatation, when slight, was attended with increased rapidity of the circulation. This appearance may perhaps be explained on mechanical principles. It is not yet agreed whether the capillaries contribute to the circulation of the blood, though it is probable that they do not; but it is certain that the motion of the blood must be considerably retarded in its passage through them, by friction at least, if not also by the vital processes which take place in them. Therefore, according to Dr Young (Phil. Trans. 1809), " The more the capillary arteries are debilitated and distended, the greater will be the mean velocity of the circulation; but whether or no the velocity will be increased in the vessels which are thus distended, must depend on the extent of the affected part; and it may frequently happen that the velocity may be much more diminished on account of the dilatation of the space which the blood is to occupy, than increased by the diminution of the resistance."—P. 26. From this it appears that a relaxation of the capillaries would, by diminishing resistance, tend to increase the velocity of the blood's motion, till the dilatation proceeded so far that the increased quantity of blood to be moved more than compensated for the diminution of resistance. It is therefore possible, for a mechanical reason, that dilatation, when it is slight and equable, may be accompanied with increased velocity of circulation; but whether the increased velocity in question is to be attributed to this cause, our knowledge of the share which the capillaries have in the performance of the general circulation is still too imperfect to enable us to determine.

Koch (op. cit. Exp. 1, A) observed, on the application of salt to the web of a frog's foot, that the motion of the blood first became more rapid, and the number of globules was apparently increased, with a proportional diminution of the serum: soon the motion be-

came slower, and per saltum irregular, so that the pulse scarcely corresponded in any two vessels. The motion of the blood soon after ceased to be progressive, and became oscillatory; and the globules gathered in heaps along the sides of the vessels, which were dilated to a half more than their usual size. At this period, when seen with the naked eye, the web presented the appearance of a newly-inflamed conjunctiva: this was not produced by any vessel receiving globules which before had not done so, but merely from the increased number of globules in them. [Marshall Hall has made the same remark. (Essay on the Circulation.)] During the experiment the circulation was observed to be quite natural in those parts of the web not touched with the solution, and in about 15 minutes the whole returned to the natural state.

Baumgaertner (Beobachtungen über die Nerven und das Blut, Freiburg, 1830), as the general result of his experiments, observed, as the first effect, only in a few cases an increased quickness of the motion of the blood, but Koch attributes this to his having in general used the stimulants too strong; next the motion was gradually more and more retarded, until at length it became oscillatory; and at last the blood was observed to stagnate completely, and present the appearance of a homogeneous red mass.

Kaltenbrunner (Experimenta cisca statum Sanguinis et Vasorum in Inflammatione, Monachii, 1826), at p. 43, relates, that on the application of dry heat, by means of a hot iron, the following changes were observed: The motion of the blood was greatly accelerated, and as the heat was increased, the rapidity increased; but when the heat was still further raised, "motus rapidus in puncto læso subito retardatur vasorumque tensio imminuitur et parietes dilatantur." The motion then became perturbed, and finally circumscribed "stases" formed. At p. 45, on the application of a saturated solution of mur. sod. the circulation became accelerated in the part, and the parietes of the vessels moderately distended, and the blood of a brighter colour; soon, however, the motion was retarded over the whole surface which had been touched with the salt; it then became perturbed, and the vessels dilated, and at length stagnation occurred, first in the small vessels, and quickly extended to the larger.

Poiseuille (Recherches sur les Causes du Movement du Sang dans les Vaisseux capillaires, Paris, 1835) applied water to the mesentery, and then gradually heated it. At first the circulation in the capillaries was increased in velocity, afterwards it was diminished, and at last the blood stagnated altogether, and islands of conglomerated

globules, which at first oscillated, and then came completely to rest, were formed.

In all these cases, the *constriction* of the vessels may be fairly presumed to have been present; but in the following experiments it was also directly observed. In Expt. 2, Koch saw the application of muriatic ether produce very distinct contraction of the capillaries during a considerable time, with increase to nearly double in the rapidity of the blood's motion; and then followed retardation, as in Expt. 1, A. In his experiments with wounds, the edges were observed, after the bleeding had ceased for a time, generally from twenty minutes to half an hour, perfectly transparent and destitute of blood.

Wedemeyer (op. cit. p. 240) saw the small arteries of the mesentery, on the application of salt, contract $\frac{1}{5}$ of their diameter, and then widely dilate; and (p. 242) when irritated by galvanism, the smaller arteries contracted $\frac{1}{4}$, $\frac{1}{2}$, and even $\frac{3}{4}$ of their diameter, with increased velocity of the blood's motion; but when the experiment was repeated after a short time, very slight contraction or none at all was observed. "In only a few cases every trace of capillary vessels was obliterated in the part of the mesentery to which the ends of the wire were applied, and only above and below this part were some of the capillary vessels leading to and from it seen dilated and filled with bright-red stagnating blood." (P. 143.)

In general, in Wedemeyer's experiments, contraction and acceleration were first seen, and afterwards dilatation and retardation (p. 326). Burdach (op. cit. Expt. 4) moistened a portion of the mesentery placed under the microscope, with a diluted solution of common salt. "Ambitus vasorum capillarium statim angustior, sanguinisque cursus magnopere acceleratus fuit." Soon after relaxation and the adherence of the globules occurred.

Kaltenbrunner (op. cit. p. 44) found that moderate dry cold hastens the circulation of the blood, "et vasa valde constingit," &c. Under more intense cold, effected by ice, the motion, which at first was accelerated, was afterwards retarded, and the parietes of the vessels dilated. The blood became of a purplish red, and the globules accumulated in large clots in the cells of the parenchyma.

(Do. p. 46.) The action of dilute vinegar is thus described: "Motus sanguinis valde acceleratur, unda affluit plena, et vasorum parietes vehementer constringuntur, et unda plena inde coarctatur." He also observes strictures in individual parts, particularly of the arteries, by which the diameter was so contracted as hardly to afford passage to a few globules. Then followed dilatation, retardation, and stases, as in the above cases. (P. 67.) Similar effects were ob-

served with muriate of ammonia, caustic ammonia, alcohol, ether, and oil of turpentine. Many more examples might be given from Thomson, W. Philip, Hastings, and Gendrin; but as these have been already adverted to in the text, we shall now pass on to state the changes which the blood has been observed to undergo during these experiments. These changes have been noticed incidentally by numerous experimenters, but they are so fully and satisfactorily described by Gluge in his microscopic researches on the blood, that it will be sufficient to give a brief account of his observations alone.

" Under certain conditions, the blood comes to rest in the capillary vessels, and the blood globules then become transformed in the following way. They lose their covering (Hülle) and colour, and only the granules remain (Kerne). These however do not remain isolated, but, through the medium of a white cementing mass, become conglomerated, and form dense, opaque, round masses of globules (Kugelhaufen), which on an average consist of 20 or 30 smaller globules, each of which, when observed by itself, is clear and transparent. These masses of globules, when either pressed or treated with vinegar, disperse themselves into smaller globules, and then it is seen that the opacity depended upon their conglomeration. In larger masses, they have a diameter of $\frac{1}{50}$th to $\frac{1}{30}$th of a millimetre, and even more; the single globules, a diameter of $\frac{1}{400}$th to $\frac{1}{300}$th mill. The colouring matter of the globules mingles with the serum, and colours it red, so that the various fluids with which this mixes may contain blood-colouring matter without carrying blood globules. This stage corresponds to what goes by the name of engorgement (engouement, Anschoppung). (Gluge, Untersuchungen, s. 12. Minden, 1838.)

That the pulsation in inflammation is the effect only of the obstruction offered to the flow of blood through the capillaries, is shewn by the following experiments. Hastings (op. cit. p. 48) found that the application of a ligature to the limb caused pulsation of the vessels of the web; and also (p. 53) that partial constriction of a vein caused pulsation in the part beyond, while the flow of blood in the rest of the web was uniform.

Kaltenbrunner, M. Hall, J. Müller, and many more experimenters, observed that when the retardation of the blood had arrived at a certain degree, the circulation then became pulsatory. This experiment of Kaltenbrunner (p. 41) exhibits the effect of placing a ligature on the vessel. The following phenomena appear when the artery is not tightly bound:—" Undæ animadvertuntur pulsus, qui cordis ictibus respondere videntur. Pressione aucta pulsus elevantur et augentur; continuata, cordis ictibus tandem non amplius respondet

et simul exiliores fiunt, donec, pressione summa adhibita, pulsuum irregularitas et paucitas eo usque progredientur ut expirent."

The effect of ligature of the vessels in producing pulsation is well shewn in the following experiment of Poiseuille (op. cit. p. 18). He isolated the crural nerve, vein, and artery of a frog, and then tied the vein; the course of the blood in the web became immediately "per saltum," and continued so for a few seconds (*i. e.* till the vein had attained its maximum of volume), and then it became oscillatory. These oscillations had at first the length of five globules, and soon after only of two; they preserved the same rhythm in the artery, vein, and capillaries of the interdigital space, and were perfectly isochronous with the contractions of the heart. On tying the crural artery also these oscillations ceased immediately, and the globules became perfectly still; and on freeing the artery they again commenced.

Poiseuille made several experiments of a like kind, in which the same phenomena were constantly observed.

We may add here an experiment of Hausmann's (H. über Entzündung, in Holscher's Hanoverische Annalen, bd. i., 1837), which shews in a direct manner that the pulsation of the artery, and supposed determination of blood, are not the cause of the inflammation. He cut one of the only two arteries leading to an inflamed foot in a horse, and found that the congestion, and other signs of inflammation, were not only *not diminished*, but the cure was prolonged beyond the time required for its accomplishment in a horse similarly affected, in which the operation had not been performed.

In reference to the opinions held by Schultze, Hodge, Pring, &c., of any inherent attractive power resident in the capillaries, or of any moving power supposed by Dœllinger, Kaltenbrunner, &c., to be inherent in the globules, although this is not the proper place for their full discussion, yet it may be useful to notice one or two of the very admirable experiments of Poiseuille upon this point.

§ I. (Op. cit. p. 8.) "Le calibre que présentent les artères et les veines est dû à la pression du sang qu'elles charrient, leurs parois sont incessamment distendues par le sang qu'elles reçoivent: ces vaisseaux reviennent subitement sur aux-mêmes, par suite d'élasticité de leurs parois, dis que la cause qui les dilate cesse d'agir. Les troncs artériels et veineux, ainsi que *les petites artères et veines*, partagent cette propriété; mais en outre ces dernières, lorsqu'elles ne reçoivent plus de sang, reviennent peu à peu sur elles-mêmes, et la diminution de leur diametre continue d'avoir lieu pendant un temps plus ou moins long." This he establishes by a number of admirable experiments,

among which we may quote Expt. 3. He isolated the artery, vein, and crural nerve in the leg of a frog, tying the other parts firmly with a ligature; he then threw a ligature round the artery, and immediately the circulation diminished in velocity gradually and equally, without jerks or pulses, until the blood came completely to rest in arteries, capillaries, and veins; which occurred in from 3½ to 12 minutes. The diameter of the crural artery below the ligature was then observed to be diminished to a half less than that of the portion above the ligature. The compression was then removed, and instantly every globule in the arteries, capillaries, and veins, which immediately before had been in a state of complete rest, started into motion like an arrow, being impelled by the blood projected from the heart through the crural artery. This experiment, similar to that of Magendie (Précis Elémentaire de Physiologie, 2de edit. tom. ii. p. 391), shews that the continuance of movement in the vessels, after the withdrawal of the heart's influence, was due to the gradual contraction of the artery and capillaries below the ligature, as it was equable and not in jerks. Again (in Expt. 5 and 6), portions of the intestines and legs of frogs were completely isolated from the action of the heart, by tying the artery and vein at the same time, after which a very slow continuous (not per saltum) movement remained in the arteries, veins, and a few capillaries, lasting from 7 to 45 minutes, while in most capillaries there was complete repose. At the same time it was remarked, that the diameter of the arteries was notably diminished, and that of the veins increased. On then cutting the vein, a portion of blood escapes, and the movement is reestablished in all the vessels, from the arteries to the veins: this grows gradually slower, and at length ceases altogether when the blood is nearly exhausted.

It is but right to notice an extremely ingenious explanation of some of the phenomena attending inflammation, offered by Mr Martyn Roberts (Mag. and Jour. of Science, 3d series, No. 121, July 1841, p. 31). Mr Roberts proved, by a series of beautiful experiments, that capillary tubes, which in their ordinary condition permitted a fluid to pass through them only by drops, or altogether prevented its passage, when highly electrified allowed the same fluid to flow from them in a continuous stream. The result of these experiments he applied to explain the phenomena of the circulation. Assuming that the heart's power is unequal to the propulsion of the blood through the capillaries, in accordance with the ordinary laws of hydrostatics, he supposes that, by the nervous influence, these capillaries become electrified, and permit the free passage of the blood. In the first stage

of inflammation he conceives the vessels to be more highly electrified than ordinary, and therefore that the smaller ones permit the entrance of the coloured globules, while before they transmitted only serum. On the same principle he likewise explains the turgescence from the diminished resistance, and consequently increased momentum of the blood.

The second stage of inflammation he describes as "re-action, that is, a diminished amount of neuro-electric influence; the force of adhesion is now uncompensated; the red particles attach themselves to the sides of the vessels, producing the state called congestion." It would be quite unnecessary to point out the various fallacies this very beautiful hypothesis involves, for they must be quite obvious to any one who has attentively perused the experiments detailed above.

Summary of the results of the experiments. (From Koch, p. 170.)

1st. On the application of gentler stimuli, and also of stronger ones, but for a shorter space, there is observed a considerable acceleration of the motion of the blood, accompanied with diminution of the circumference of the capillaries in the part affected. (Spallanzani, Thomson, Philip, Hastings, Burdach, Kaltenbrunner, Oesterreicher, Wedemeyer, Baumgaertner, and the author—Koch.)

2d. The increased quickness ceases after a longer or shorter period, and, especially after a stronger irritation, passes into a retarded motion, while the spaces between the globules become lessened, and thus they follow more closely upon each other. (Haller, Spall. Hast. Burd. Kalt. Oest. Baum. Koch.)

3d. Next the motion of the globules, which hitherto had been quite uniform, and accelerated at regular intervals only in the neighbourhood of the arteries, in accordance with the pulse in them, becomes irregular, jerking, and oscillating up and down. (Leeuwenhoeck, Haller, Spall. Kalt. Oest. Baum. Koch.)

4th. After some time, single globules attach themselves to the walls of the vessels, and cease completely to move. The number of these gradually increases, till at length they form a brownish-red mass, in which the original form of the globules is no longer to be recognised. Along with this is combined a very marked dilatation of the capillary vessels, which may reach even double the diameter in the healthy state. (Haller, Spall. Thom. Phil. Hast. Burd. Kalt. Oest. Wedem. Baum. Koch.)

5th. The globules then become fewer, and appear as opaque bodies, while they dissolve [partially] in the serum, and give to it a uniform bright-red colour. (Haller, Hast. Kalt. Wedem. Baum. Koch.)

6th. In the parts around those vessels in which the blood is stag-

nating, the phenomena described in the first, second, and third experiments are observed; in the nearest, those in the third; farther off, those in the second; and in the most distant, those in the first.

7th. Those capillaries in which dilatation, and stagnation, and dissolution of the globules have taken place, return, after a longer or shorter period, to the natural state, in the order in which the development of the diseased phenomena followed. (Haller, Hast. Kalt. Burd. Baum. Koch.)

8th. After incised and punctured wounds, stagnation and dissolution of the globules always occur, along with dilatation of the capillaries, preceded by the same changes as from the operation of other irritations. (Haller, Koch, Kalt., the last especially, who gives this as a constant condition of his " inflammatio sanans.")

9th. After the conglomeration of the globules and the retarded motion of the blood are established, sudden movements of the limb, and various stimulants, such as alcohol, ether, electricity, &c. may for a short time restore the forward motion of the blood; but the previous condition returns in an aggravated degree, provided the inflammation be sufficiently pronounced. But in general the influence of a stimulus is only perceptible in the more prolonged and accelerated extension of the inflammation. (Philip, Hast. Kalt. Koch.)

10th. The more violent the irritation (within certain limits), the sooner is the stagnation and the greater the conglomeration of globules and dilatation of the vessels. (Kalt. Burd. Koch.)

11th. In the more severe and extensive affections the small arteries and veins take part in the change in the capillaries. (Thom. Hast. Kalt. Wedem. Koch.)

CHAP. IX.

FEVER.

THEORIES OF FEVER — STAGES OF FEVER AND INFLAMMATION — KINDS OF INFLAMMATION — PHLEGMONOUS — ERYTHEMATIC — SCROPHULOUS AND SCIRRHOUS—RESOLUTION—METASTASIS—CRITICAL DISCHARGES.

A common attendant on local inflammation, as before remarked when speaking of sympathy as an exciting cause of disease, is fever; and this morbid change consists equally evidently in a preternatural dilatation of the capillary vessels of the whole surface of the body, produced always (at least when it arises from local inflammation) by, first an increased, and afterwards a diminished action of these vessels, since the immediately exciting cause of fever in this case, viz. sympathy, operates always as a stimulus. The doctrines with respect to the nature of fever have at all times depended more or less on those which were prevalent respecting inflammation. Thus by the dogmatists of old it was referred to a general instead of a local overflow of one or other of the four chief fluids of the body, all the continued forms of fever being ascribed to that of the blood; the tertian fever to that of the yellow bile, the quartan to that of the black bile, and the quotidian to that of the phlegm. By the methodists the aforesaid corpuscules and pores

were again put into requisition, the sticking of the middle-sized corpuscules (not in certain parts alone, but throughout the body) constituting a tertian fever, that of the smallest a quartan fever, that of the largest a quotidian, while in continued fevers there was a simultaneous sticking of them all. We smile in our wise moments at such doctrines as these, but how closely do we, in our foolish moments, blinded by some new bubble, frequently imitate them.

The theories of fever adopted by Van Helmont, Stahl, Hoffmann, and Cullen, entirely corresponded with their respective notions concerning the operation of the exciting causes of disease in general, and the nature of inflammation in particular; but all for the most part concurred (however much they differed in other respects) in representing fever, as the ancients had also done, as an effort of nature to repel a threatened injury. For this purpose, according to Hoffmann and Cullen, an unusual supply of blood was to be retained in the internal parts of the body, which could be brought about only by forming a spasm of the extreme vessels upon the surface; and the cold stage of fever being thus produced, the hot and sweating stages were the result, the former of the inordinate action of the larger arteries in order to overcome this spasm, and the latter of the success with which these measures were at length fortunately crowned. The notions of Brown (who was followed by Darwin and others) respecting the nature of fevers, are much more simple, since he rejected altogether the interference of the vis medicatrix naturæ; but he seems to have been equally mistaken as his predecessors in considering the first stage of fever, not indeed, like Cullen, as one of debi-

lity, but as one of generally diminished excitement, owing to the operation of a sedative cause; and the second stage as one of generally increased excitement, the consequence of accumulated excitability, followed of course by collapse and asthenia. Now it must be abundantly obvious that it is the first stage of fever which is (as in inflammation) that of increased action, at least with regard to the extreme vessels of the surface of the body (the essential seat of the morbid change), and the second that of diminished action with respect to these vessels, and this whether the exciting cause be stimulant or sedative. It is true, the increased excitement of these vessels being always attended by a diminished excitement of the rest of the body, and the diminished excitement of these vessels by an increased excitement of the rest of the body (effects for which we shall in future endeavour to account), it is difficult to divest one's self of the notion that the cold stage of fever is one of deficiency of action, and the hot stage of increase of it; and it was this which gave occasion to Dr Armstrong to call the three stages of continued fever (corresponding to the cold, the hot, and the sweating stage of an intermittent) by the names of the stage of oppression, that of excitement, and that of collapse, names which, it must be remembered, apply only to *the state of the body in general*, and not of the capillary vessels of the surface, which during the stage of oppression are in a state of preternatural excitement, during that of excitement in a state of corresponding collapse, and during that of collapse in a state of re-action. "Whenever," says Dr W. Philip, "increased temperature, swelling, and redness appear,

the capillary vessels are debilitated, and preternaturally distended." Now, in the hot stage, the whole surface is affected with increased temperature, redness, and swelling. The deduction is obvious, and the analogy of fever, in every respect, with inflammation, is too manifest to require further comment. In fact, inflammation and fever differ only in their seat and in their degree; the seat of inflammation being anywhere, and more or less circumscribed, and its degree commonly considerable; whereas the seat of fever is always in the whole surface of the body, and its degree commonly slight. It is here however meant only that the degree of inflammation in any given number of capillary vessels is commonly slight in fever compared to that of inflammation more properly so called; but the number of them so affected much more than compensates for the slightness of the inflammation of each, and the constitutional affection is of course great in proportion.

With respect to local inflammation, the *first stage* of it, or that corresponding to the cold stage of fever, is in general so little remarkable, as to have acquired no particular name (the real latent stage); and it is accordingly to the second stage alone, or that corresponding to the hot stage of fever, and indicated by swelling, redness, heat, and pain, that the term inflammation is commonly applied; and it is to this stage that the term is intended to be confined as often as we say that inflammation consists in *diminished* action, since it is obvious, that in the first stage it is, like fever, a state of *increased* action. In the first stage, however, unlike fever, it usually attracts little or no notice (the preternatural contraction of a few capil-

lary vessels giving rise to no remarkable symptoms, however remarkable may be those which attend the constriction of the capillary vessels of the whole surface of the body); so that by inflammation, in the common sense of the word, we signify the second stage alone, or that indicated by swelling, redness, heat, and pain. In this second stage, inflammation, though perhaps situated always in the same system of vessels, assumes very different characters, according to the tissues affected. Thus, in a general way, it may be said that, in inflammation of the cellular, serous, fibrous, osseous, nervous, cartilaginous, muscular, and arterial tissues, the swelling is usually circumscribed, its surface frequently acuminated, the colour is bright-red, and the pain throbbing. In that of the mucous, dermoid, and venous tissues, the swelling is usually diffused, and its surface flattened; the colour is dingy, the heat superficial, and the pain scalding. In that of the preternatural tissues, called tubercle, encephaloid tumours, &c. (to be presently mentioned), the swelling is usually of intermediate extent, and its surface is rounded, while its colour is pink, and the heat and pain inconsiderable; and, lastly, in that of the preternatural tissue, called scirrhus (likewise to be presently mentioned), the swelling is of various extent, its surface is knotted and irregular, the colour is of a leaden or purple hue, and the heat is still inconsiderable, but the pain acute and lancinating. The first kind of inflammation is called phlegmonous, the second erythematic, the third scrophulous, and the last scirrhous; the peculiarity of each depending obviously upon the peculiar distribution of the capillary arteries and other ves-

sels, constituting the parenchyma of each. It is proper to observe, however, that the scrophulous and schirrous kinds of inflammation are called sub-inflammation, and are supposed to be situated, not in the capillary vessels, arteries, and veins, but in the capillary, lymphiferous, and chyliferous vessels alone; and this opinion has been embraced by Dr Baron and some other British pathologists; but it appears to be altogether hypothetical and improbable, and of very little practical utility.

It belongs more properly to the head of Semiology than to this place to explain whence arise the swelling, redness, heat, and pain, which commonly characterize inflammation, as well as why the characters of the symptoms should differ according to the tissue affected; and we shall accordingly defer for the present entering into these particulars. To those who are acquainted with the structure of the several tissues of the body, and with the character of the parenchyma of each, a great deal of what remains to be said upon this subject will readily suggest itself; and they will be at no loss to perceive why it was just now observed that it could only be said *in general* that such and such were the characters of the respective kinds of inflammation which have been mentioned. For the most part we admit, by name only, the phlegmonous, erythematic, scrophulous, and scirrhous inflammations, making the first affect no fewer than seven or eight distinct tissues, the second two or three, the third an equal or greater number, and the fourth alone only one. But it is evident that if the cellular tissue differ from the serous, and this from the fibrous, and so on, the phlegmonous inflammation must be of as many dif-

ferent species as there are kinds of tissues affected by it; and the same remark may be made respecting the erythematic and scrophulous inflammations. It cannot be questioned, in fact, but that we ought to have as many distinct species of inflammation as there are distinct tissues in the body, and it would be well for pathological precision if the old and vague distinctions of inflammation into phlegmonous, erythematic, &c. were altogether abolished; for what can be more unlike than the inflammation of cellular tissue and that of a serous membrane, and of that of a serous membrane and half a dozen other tissues, all confounded in the general name of phlegmonous? But besides this, the individual tissues are not always the same (with respect, at least, to the character of their inflammation) as situated in different organs: that, for instance, of the mucous tissue of the larynx is strikingly different from that of the same membrane as situated in the trachea, so that we require perhaps not only as many kinds of inflammation as there are tissues, but as many varieties of them as there are organs into the composition of which the tissues enter. Nor is this all, for inflammation, as situated in the *same* tissue of the *same* organ at different times, is strikingly different in its characters. Witness that of the dermoid tissue. The subject is one of extreme interest, and is beginning to attract the attention which it deserves, and which it is surprising it has not before met with.

Third stage—resolution.

Now in this second stage of the complaint, whether of inflammation or fever, it frequently happens that the inflamed vessels, having wholly recovered their

irritability, return more or less speedily to their natural state; but the new irritation—for natural irritation is now new irritation—being conveyed by sympathy to some distant organ, sometimes excites there a sympathetic irritation, rapidly followed by collapse, and going on frequently to a degree of re-action, from which results some increased discharge, called critical, though it is to be *considered as a consequence and an indication* rather than a cause of the termination of the primary inflammation. Such increased discharges from distant parts, on the termination of any local inflammation, seem to be quite analogous to the increased secretion of milk from the contraction of the uterus after parturition, and consist principally of liquid stools, lateritious urine, sweat, or blood; and it is this which is called the termination of such complaints in resolution. Sometimes, however, the collapse of the vessels secondarily affected is not followed by such rapid re-action as to produce discharges, but the vessels remaining in their dilated state constitute a more or less violent sympathetic inflammation: it is this which is known in medicine under the name of metastasis. The termination of inflammations and fevers by what is called resolution, and the increased discharge from a distant part which usually attended such a termination, have been noticed from the most ancient times; and it was from observing these increased discharges (to which they attributed the termination of the primary disease, instead of regarding them as its consequence) that the earlier physicians had recourse to the remedies called revulsive, the

operation of which will be more fully considered in future.*

* The critical discharges, as they are called, were attributed by the humoral pathologists to a translation of the morbific matter, lately alluded to as the primary cause of inflammation, which, when it passed off by some of the outlets of the body, there was of course an end of the matter. They could not avoid noticing, however, that in the case of metastasis there was no discharge, and yet the primary disease ceased, and hence a new "Deus in fabula" was to be called in, in the person of "counter-irritation;" and it became established as an axiom, that the body could not bear two irritations at once; so that if a new one was by any means introduced, the old one always retired. This did tolerably well as long as inflammation was looked on as consisting in *increased* action or irritation, and to be curable by diminishing it; but if it was tenable while this was the notion, it is manifestly untenable now that we know so much better. To this subject we shall have occasion to recur in future, under the head of revulsive remedies. If inflammation be diminished irritation, the cessation of it must imply that the irritation is increased; and it is consistent with all we know of the nature of irritation, to believe that it may be translated by sympathy, as it were, from one organ to another; and that the effects of this translation would in these instances have been such as have been above described, might reasonably have been inferred.

CHAP. X.

INCREASED SECRETION.

HYPERTROPHIES—ORGANIZABLE LYMPH—ORGANIZATION OF LYMPH —[WEBER'S OPINION]—SIR E. HOME'S EXPLANATION—TALIACOTIAN OPERATION—REGENERATION OF LOST PARTS—NECROSIS—SO CALLED EFFUSIONS—ANCIENT OPINIONS—NOSOLOGY.

Should the revival of the irritability of the vessels primarily affected with inflammation or fever be less perfect than takes place in resolution, as the secretions from the capillary arteries are always, *ceteris paribus*, great in proportion to the quantity of blood which they contain, it will necessarily follow, that as they slowly recover their irritability after either inflammation or fever, there must be a greater than usual deposition of matter, either natural or preternatural, from these arteries; which increased deposition may be considered as constituting, properly speaking, the third stage of both. It is thus that inflammation may give rise to the formation, when the increased deposition is of cellular tissue, or of almost any other, of indurations, hypertrophies, and strictures (the last from the compression of the contiguous sides of the canals); when of the mucous or other tissues lining canals, of polypi, teeth, and so

forth; when of the serous, of adhesions; and when of the cartilaginous and osseous, of cartilage and bone; in all which cases, though the quantity of the deposited matter is increased, or the deposition is in unusual places, the quality is still natural. But, on the other hand, the *quality* of the deposited matters is sometimes quite preternatural; and it is thus that we may explain the formation of hydatids, worms, tubercles, encephaloid tumours, melanosis, scirrhi, calculi, and other morbid depositions, many of which are susceptible, in their turn, of secondary inflammation and its consequences.

These depositions of solid matter, at least of such as are natural, appear to take at first the form of organizable plastic lymph, commonly described as *effused*, but properly as *secreted*, by the inflamed capillary vessels, and subsequently organized, either from forming within itself channels, into which nerves and vessels shoot from the neighbouring parts, and thus convert it into an organized substance; or from containing within itself the germs of its future nerves and vessels, which being developed first in its substance, extend gradually to the neighbouring parts, and thus connect them with the newly organized mass. Organizable or plastic lymph becomes inspissated almost immediately upon its deposition, and soon concretes into a kind of jelly, which becomes gradually firmer, and hence is known by the name of coagulable lymph; but it is perhaps better to discontinue this term, partly because it seems to perpetuate the erroneous notion that it consists merely of a pre-existing portion of the blood, which it certainly is not, and partly because the inspissation of the substance in question seems to

depend on a process very different from that by which the fibrous part of the blood becomes coagulated, the former arising from organization and life, the latter from merely the physical arrangement of the particles of its fibrine now for the first time left sufficiently long undecomposed.* It is still a question, however, whether this organization of the newly-deposited substance be from without or from within; the former opinion being the more common, and the latter perhaps the more correct one. The most philosophical view of the subject appears to be to regard organizable lymph as a kind of germ, and its organization as depending on the same laws as those by which that of the embryo is effected. Now we have already endeavoured to show that, in the latter case, the first appearance of nerves and vessels, the most essential condition of organization, takes place principally or entirely in isolated points, without any dependence upon a common matrix, and that it is rather by a union of smaller into larger and larger branches that trunks are formed, than by a splitting of larger into smaller and smaller ones, that capillary vessels are constructed.

In this case each point of the body is organized *per se*, certainly without any extension into it from without of blood-vessels which perhaps do not yet exist, or any propulsion into it from without of blood, by the *vis a tergo* of the heart and arteries, which perhaps are not yet in action. And there is the strictest analogy between the organization of the several parts of the embryo, and that of the lymph deposited as the

* See Rudiments of Physiology, part i. p. 114.

result of inflammation. The isolated origin of blood-vessels, as noticed by Harvey and others, in the vascular area of the yolk of the incubated egg, has already been mentioned; and it was observed by Hunter that lymph, in the progress of its organization, presented appearances precisely similar. We have also already mentioned the observations of Dœllinger respecting the progressive development from smaller to larger of the vessels in the embryo of the fish; and observations very similar had previously been made by Gruithuisen of Munich* with respect to the formation of new vessels in lymph during its organization. According to the last-named author, these vessels have at first the appearance of minute red points, which, becoming gradually larger, assume either a linear or serpentine shape, and afterwards throw out on every side radiated striæ, which, uniting with striæ proceeding from other points, give rise to small irregular net-works. For some time the fluid remains stagnant in these new vessels, but a communication being sooner or later established between some of these and the contiguous capillaries, they thus come to constitute a part of the general circulation. Similar descriptions are given also by Meckel,† Beclard,‡ Lobstein,§ Hastings,‖ Kaltenbrunner, and others; the last in particular (although he does not believe that this is the *only* way in which the new

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* Organozoonomia, Introduct. p. 6. 1811.

† Handbuch der Pathologischen Anatomie, vol. ii. p. 30.

‡ Anatomie Général, p. 331.

§ Lobstein, Elem. Anat. Path. p. 297. On the Inflammation of the Mucous Membranes, Intr. p. 87.

‖ Journal des Progress., &c. 1828.

vessels are formed) describing the primary channels in the lymph as forming by their elongation crescentic lines, the two cornua of which are turned outwards, and at length connected with some contiguous capillary vessel, almost precisely as occurs during the development of the fish embryo, as described by Dœllinger.* On the other hand, Laennec, Gendrin, and some few more, still support the more popular opinion, or that which has been generally prevalent since the times of Fontana and Spallanzani, and which it will take probably a long time entirely to supersede, that the new vessels in organizable lymph are formed, not *per se*, but either by the extension by offshoots of the blood-vessels of the contiguous parts, or by the propulsion into it of blood by the *vis a tergo* from these vessels, which blood afterwards forms its own vessels. Gendrin admits, indeed, the points, the lines, and striæ, &c. as displaying themselves in the process of the organization of lymph; but he supposes that

* [According to Professor Weber of Leipzig, the process that lymph undergoes in its organization seems analogous to that of the development of the embryo. Upon the surface of the wound, or wherever else the deposition is going on, there is a substance deposited, which takes the form of minute globules, from which cells become developed; between these cells there remain spaces which take the form of canals; in these spaces there remain free globules, which become converted, by some process as yet unknown, into blood globules, and the canals take on the appearance of perfect blood-vessels. Then it seems that a portion of the partition-wall which divided those newly formed canals from the blood-vessels of the neighbouring tissue is absorbed, and thus that the adventitious deposit becomes included in the general circulation (oral communication, 1841). Valentin likewise observes, " the development of blood-vessels in the effused lymph appears to obey the same laws which direct the original formation of the blood in the embryo. (Valentin's Rep. bd. ii. p. 260.)] —Editors.

these are not ready-made vessels, but merely a hollowing out of irregular passages in the least resisting part of the lymph by the *vis a tergo*, and that the coats of the vessels are afterwards formed by the adhesion of some of the globules of the blood to the sides of the intervascular space. Perhaps it is hardly worth while to mention, that by Sir E. Home (Phil. Tr. 1818-19), and his coadjutor Mr Bauer, following a hint of Borelli, Faber, and Hales, this hollowing out of passages by lymph was a short time ago ascribed to another cause, to wit, the evolution, at the moment of its coagulation, of some free carbonic acid contained in it as an ingredient of the blood, so that being left channelled through in every direction, the *vis a tergo* had not to force itself passages, but merely to send the blood along passages already prepared for it. This assumes, first, that the blood contains free carbonic acid, which it evolves at the moment of coagulation, which Dr Duncan has proved to be false; it assumes, in the second place, that organizable lymph (which is in all probability not a part of the blood, and merely effused from its vessel, but a product from the blood, and, like all such products, the result of secretion) both coagulates like the blood, and gives off carbonic acid, which is manifestly false; and it assumes, in the third place, that this supposed evolution of carbonic acid would leave behind, not a mere spongy mass, as in making bread, but a mass intersected by regularly ramifying canals, which in no other instance is the case. In all likelihood the tubular appearances delineated by Sir E. Home in the coagulum, both of the blood and lymph, result from the spaces left for the accommodation of the enve-

lopes of the central nuclei, when the latter have become amalgamated by coagulation; and there is no reason for doubting that these spaces may be filled by a *forcible* injection from the neighbouring arteries, although the hypothesis founded on these facts seems to be quite untenable. It proves moreover *too much;* for if it were true, the blood as well as the lymph should be a medium of new growth, while it is known not to be such. This was believed by Hunter, but is certainly false, because, 1st. when effused between the lips of a wound, it is almost always absorbed; 2d. if it be not absorbed, adhesion does not go on; 3d. it is never organized in aneurism. But besides these particular objections to Sir E. Home's improvement on the theory in question, many general objections may be found to any modification of it, more especially the total impossibility of applying it to explain the development of the embryo, its inconsistency with the alleged course of fluids in the newly-formed part, and its assuming that the vessels in the neighbourhood of the deposited lymph are always open-mouthed, ready to pour blood into it, which is a mechanical and false view of the matter; and that the blood so poured in is capable *per se* of forming its own vessels, which, as implying the life of the blood, is obviously absurd. If the lymph were previously irritable, its organization must have preceded any supply of blood from the contiguous parts; if not, no such supply could render it so. Upon the whole, we can hardly refuse to believe that the chief, if not the only, way the lymph becomes organized, is from containing within itself from the first the germ of its own organization, and that the union of the tissues so

formed with the neighbouring parts is effected rather by shoots from the new tissues into the old ones, than in the opposite direction; and we cannot help observing thus *in limine*, how well this seems to explain the origin of parasitical animals,—reducing the process to even a simpler one than that by which other tissues, either healthy or morbid, are formed,—as well as the more or less isolated nature perhaps even of healthy tissues in excess or in preternatural situations, where we know how much more liable they are than under other circumstances to subsequent disease, and certainly of morbid tissues in general,—tubercles, encephaloid tumours, melanosis, and scirrhus,—and the little control which we possess over them by any means calculated to act with energy upon the rest of the body. But of this hereafter.

Such, then, appears to be the nature of the process by which either healthy tissues in excess or in preternatural situations, constituting hypertrophies, strictures, polypi, adhesions, conversions into cartilage and bone, or morbid tissues, such as hydatids, worms, tubercles, and the others just enumerated, appear to be deposited as the result of inflammation, and by which further wounded or ulcerated parts are healed, either by what is called the first intention, or by granulation, and separated re-applied parts are brought not unfrequently again to adhere, and even lost parts occasionally *in toto* regenerated.

When a simple solution of continuity is produced in a living tissue, the divided extremities of the capillary arteries and veins are soon closed, and the blood stagnates on each side of the wound, generally as far as the nearest anastomosing branches, which

soon become dilated, and display all the phenomena of inflammation. The coagulated blood in the cut extremities of the vessels is in the mean time soon absorbed, and an oozing of organizable lymph takes place generally in from six to twelve hours, from the inflamed vessels, between the lips of the wound, already brought into approximation, which becoming organized, and taking on gradually the character of the tissue which has been divided, not the smallest cicatrix, under favourable circumstances, remains visible. Precisely similar to this is the healing of an ulcer (for it is not, as has been supposed by Sir E. Home, the pus which is the medium of union), which, upon becoming organized, takes at first the appearance of small red points or granulations, the vessels primarily formed in which extend afterwards to the neighbouring capillaries, and the whole at length assume the character of the tissue which produced them.

A similar process takes place when an organ, or a part of an organ, has been entirely separated from the body, and within a certain time re-applied to the wound; or when such an organ, or part of an organ, has been wholly or partially removed from one part of the body, and applied to another previously scarified for the purpose; or, lastly, when a separated organ of one animal has been ingrafted with proper precaution upon the parts of another. Of the first of these processes, we have examples in the re-union of parts of ears, noses, fingers, &c. which have been either cut or bitten or bruised off, and within a certain time re-applied to the wounds;* of the second, in the

* Garengot, Duhamel, Ballonius, Murray, Balfour, J. Hunter, Weiseman, Graafe, Gendrin,

numerous modifications of the taliacotian operation, for repairing mutilated ears, lips, noses, &c.* from the arm, forehead, chest, and other parts of the patient; and in the third, in that modification of the taliacotian operation in which the mutilated parts were repaired from the organs of others. Schoolboys also have been known to exchange parts of their flesh with each other as a mark of indelible affection. Other examples may be found in the well-known expedient of ingrafting the teeth of one person into the jaws of another, or the teeth of man upon the comb of a cock, the testicles of a cock upon the abdomen of a hen, and so forth.† In these cases the deposition of organizable lymph will often of course be from one surface only, but this is sufficient as long as the vessels of the other surface, though no longer susceptible of the necessary degree of inflammation, still retain sufficient irritability to be acted on by the new blood which they receive from the living medium of connection. In repairing mutilated parts from others in the neighbourhood, as the nose from the forehead, &c. it is usual to leave a connecting slip at the part where the graft is turned, and one for the purpose of keeping up the circulation by this means, till the union by means of the new vessels has become established. It is questionable, however, how far this practice is either requisite, or even advisable. A very little blood is sufficient to keep up the requisite inflammation in

* Vesalius, (de Val. iii. 9) Taliacotius, Mercurialis (de Decoratione), Fallopius (de Decoratione), Hildanus (cent. iii. obs. 31, nasus abscissus quomodo restitutus), Schultze, Resaulne, Dubois, Carpue, Hutchins, Davis, Liston, Earle, Ligas, Dieffenbach.

† Duhamel, Hunter, A. Cooper, &c.

the graft, when the re-action, as it is called, is once begun, that is to say, when the capillary vessels, after the previous constriction which they undergo from the violence of the stimulus applied to them, have once become dilated; and, more than this, is so far from favourable, that it is highly prejudicial to the deposition of organizable lymph, and prone to hurry on the inflammation to suppuration or gangrene: at any rate, Dieffenbach, the most practised taliacotian of the present day, finds that there is more frequently too much than too little blood in the part in question. The tendency which transplanted parts have to take on a character adapted to their new situation (as of dermoid tissue with its bulbs and hairs, to become mucous tissue with its follicles, and *vice versa*), is one of the most striking illustrations of the dependence of all vital actions upon the nature of the stimulus by which they are excited—absorption as before, nutrition modified.

The last process that remains to be mentioned as affected by organizable lymph, is that by which lost parts are occasionally entirely renewed. The tendency to this renewal seems to be great in all animals, almost in the inverse ratio of the perfection of their organization, as indeed we should *a priori* expect would be the case; the diffusion of the principal vital organs being of course favourable, as their concentration is unfavourable, to the display of this phenomenon. In plants, accordingly, the power is almost unlimited, and in invertebrated animals it is very considerable. Thus the fresh-water polype, if cut into twenty distinct pieces, will become twenty distinct

animals, each piece regenerating the other nineteen when it finds itself deficient. The sea-anemone and earth-worm will regenerate either extremity of which they may be deprived; the snail will regenerate its head, with its eyes and other appendages; the cuttle its tentacula; the star-fish its rays; and the crab and lobster their tentacula or legs, which, relying upon this power, they are said sometimes to throw off when alarmed, as by a thunder-storm, by way of recreation. Nor is it to invertebrate animals alone that this power is confined, since vertebrate animals, particularly reptiles, possess it in a very remarkable degree,—as the frog, the water-newt, the lizard, &c. most of which can regenerate their eyes, limbs, tails, and other parts. All this has been abundantly proved by the experiments of Bayle, Reaumur, Spallanzani, Bonnet, &c. in whose days it was a favourite subject of investigation to inquire of how many of its organs every animal could be deprived with a fair prospect of their regeneration, and even into how many portions it could be divided with a chance of each portion serving as a nucleus for a future being.

By the hot-blooded animals this power is possessed in a comparatively insignificant degree; but instances are not wanting in which it has been displayed even by man, as in the regeneration of the crystalline lens,* of the end of the finger,† of the glans penis,‡ of the os tincæ, and even of the complicated apparatus of a

* Lond. Med. and Phys. Jour., 1817.

† Journal de Physiol., Jan. 1827.

‡ Edin. Med. and Phys. Essays.

joint, and still more commonly of numerous smaller arteries in place of a portion of some larger one, such as the carotid, which has been obliterated,* or of a bone which has been wholly or partially removed by necrosis. Nothing need be said here of the periodical regeneration of the horns of the stag, of the cuticle of worms, and shells of apterous insects and the crustacea, and so forth; since, although these processes, or at any rate the first of them, is effected by the same means as organs accidentally lost are regenerated, it belongs rather to the natural process of nutrition and secretion than to this: and into the process by which lost organs are renewed we need not enter in this place, since it seems to differ from that by which wounded parts are healed, or separated parts reunited, only in being in general more complicated. It consists in lymph which is thrown out being spontaneously organized, and subsequently depositing all the tissues requisite to form the entire organ, in the same way as during their original development. In case of the renewal of complex organs, that is to say, of organs consisting of several distinct tissues, it appears that lymph furnished by the vessels of any one of them may under certain circumstances generate new vessels during its organization, which are competent to form not only this tissue, but all the rest which are requisite to the perfection of the organ, although perhaps most of the difference between these tissues is to be attributed (as in the so-called conversion of dermoid into mucous tissue lately alluded to) to the different stimuli which in different parts of the

* Parry, 1819. Magen. 1823. Ebel. 1826.

new organ they are exposed; but however this may be, it is reasonable to believe that when a simple organ, that is to say, one composed only of one tissue, like an artery or a bone, is to be renewed, the lymph must be furnished by the vessels of proper arterial or osseous tissue, as this alone can, during its organization, generate such new vessels as are calculated to form the tissue in question.

The opinion that the bone is deposited "ab initio" by the vessels of the periosteum, has been already alluded to; and when bone is renewed after necrosis, it has been supposed to be effected at one time, as by Du Hamel, Blumenbach, Dessault, M'Donald, Hutchison, Meckel, and others, by the vessels of the periosteum, and at another, as by Russell, by those of the cellular tissue. It can, however, in all probability, be renewed only by the vessels of the bone, but whether of that portion of bone which has been unaffected by disease, as supposed by Haller and others, or of the bone already diseased and preparing to die, as supposed by Mr Syme, is a question. The latter, however, seems to be the case; the vessels of the bone, during the minor degree of inflammation which it suffers previously to that intense degree which is to terminate in its death, deposit around it organizable lymph, and in proportion as it afterwards dies, a coating of new bone is ready to supply its place.

So much, then, for the termination of inflammation in the deposition of organized tissues, natural or preternatural.

Owing to what laws it is that the inflammation of certain parts, and in certain individuals, goes on to the deposition, at one time of one morbid tissue, at

another of another, we must of course be incapable of explaining, until we are far better informed than at present, why one set of vessels in the healthy state deposits bone, another muscle, and so forth; in other words, till the laws which regulate nutrition in general are much better understood.

But, in the same manner as inflammation may give rise, on the one hand, to the deposition of solid substances, either natural or preternatural, and either organized or otherwise, so it still more frequently occasions an increased deposition of various fluids, either natural or preternatural. Among the former are fat, stools, mucilage, blood, bile, pancreatic fluid, saliva, halitus, and sebaceous fluid, in all which cases the increased *quantity* of the deposited matters is chiefly remarkable. But, on other hand, the *quality* of the deposited fluid matters, as well as the solid, is sometimes preternatural, of which nature are air and pus, the latter of which also may be laid down in tissues, either natural, as the cellular, serous, fibrous, &c., or preternatural, as tubercular, encephaloid, and so forth. With respect to the deposition of fluid matters in general, or at least of such as are natural, little hesitation is felt in referring most of such instances directly to increased secretion; but exceptions to this explanation occur in the cases of an increased deposition of halitus and blood, which, like that of coagulable lymph just spoken of, as the rudiment of the solid tissues resulting from inflammation, is generally spoken of under the name of effusion, or a kind of mechanical straining of either the whole blood, or some parts of it, through certain pores of the vessels. It seems to be quite time, however, that these merely

mechanical views of the molecular action of the living body, whether healthy or diseased, should be once and for ever abandoned, and that neither dropsy nor hæmorrhage should be any longer spoken of as the result of effusion, any more than an inordinate deposition of fat, stools, mucilage, bile, or other fluids, which are never described otherwise than as increased secretions. To this subject we shall have occasion to recur in future; but it may be remarked here, that this is not merely a verbal exception, the practice of speaking of dropsies and hæmorrhages as *effusions* having long served and still serving to perpetuate very false views of the nature of the morbid changes in question, and of the effect of remedies commonly employed to counteract or remove them.

It is the stage corresponding to this third stage of inflammation which constitutes in fever what is ambiguously called the stage of *collapse* when the fever is a continued one, or the *sweating* one when it is an intermittent; but, as has been already remarked, this stage is, with respect to the vessels primarily affected, that of incipient re-action, although, with respect to the rest of the body, it is not improperly called that of collapse.

So much, then, for two terminations of inflammation, that by resolution, and that by increased secretion. It is common to speak of the terminations of inflammation as principally these, that by resolution, that by suppuration, and that by gangrene; but this seems to be a very inadequate enumeration, the secretion of pus being only one of a very great number of increased secretions from this cause, referrible, in the first place, to the four heads of healthy tissues

and morbid tissues, healthy fluids and morbid fluids, of the last of which pus is an example.

Lastly, should the irritability of the vessels be quite irrecoverably lost in inflammation, and neither of the processes above mentioned (resolution or increased secretion) take place, the consequence will be a total destruction of the vitality of the organ so affected, or what is called the termination of the inflammation by mortification, of which the incipient degree is called gangrene, and the confirmed sphacelus.

Now, each of the morbid depositions resulting from inflammation,—whether of natural tissues in excess, or of such as are preternatural; of natural fluids in excess, or of such as are preternatural,—may give rise in its turn to certain trains of symptoms, and must therefore be considered as a distinct proximate cause of disease. Of each of the most important of these, therefore, considered in the general way, a few words may be subjoined in this place.*

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* The ancient Greeks and Romans, followed by the Arabians, the chemists, &c., involved in their synthetical systems of pathology, had paid little attention to this, the surest foundation on which such a system could have been founded. By them every disease (*i. e.* every collection of symptoms) was considered *a priori* to depend upon certain influxes, or vitiations of certain fluids, real or supposed, instead of its cause being sought, where it might so frequently have been found, in the sensible change which the body had undergone; and the pernicious invention, by more modern writers, of systematical nosology, or the art of distinguishing and classing diseases from their symptoms alone, has tended in a still greater degree to draw the attention from the *substance* of pathology, and to fix it on the *shadow*, and taught them to be satisfied with a jargon of hard names, "full of strange sound and fury, and signifying nothing," instead of leading them to the knowledge of a few tangible shapes, in which the essence of disease in general consists. A disease, it is true, *consists* of a collection

of symptoms, but it is not these symptoms which we are called upon to treat, but the proximate cause of these; nor is it the symptoms, which are never in any two persons or on any two days alike, that are susceptible of arrangement. We shall take another opportunity of expressing our opinion of nosology in general, and remain satisfied with remarking at present, that the only essential condition of disease is some morbid change, either of function or structure, in some part of the body; and the only legitimate plan of arranging them must be founded upon knowledge of their morbid changes, and of the organs in which they occur. It is owing to the want of attention to this simple fact, and to the unphilosophical practice of arranging and enumerating diseases after their symptoms alone, that so great a variety of such arrangement (exclusive of the fancies of the nosologists), and such an infinite difference in the enumeration of individual diseases, are to be met with in different authors. Thus we have them arranged sometimes with respect to their *type*, into continued, remittent, and intermittent; sometimes with respect to their *prevalence*, into sporadic, endemic, and epidemic (Hippocrates); sometimes with respect to their *dependence*, into idiopathic, essential and primary on the one hand, or symptomatic, consecutive, and secondary on the other; sometimes with respect to their *extent*, as general or local; sometimes with respect to their *individuality*, into simple or complicated; sometimes with respect to their *manifestations*, into well-marked or anomalous; sometimes with respect to their *intensity*, into mild and maliguant; sometimes, lastly, with respect to their *duration*, into acute and chronic. Nor has the enumeration of individual diseases been less various, in different hands, than their general arrangement.

There is every reason for believing that the number of diseases (in spite of the hackneyed opinion, in their greater abundance in these degenerate days, when it is said "unnatural deeds breed unnatural troubles,") has been always pretty nearly, if not entirely, as great as at present, although, from the very different light in which their constituent symptoms have been at different times contemplated, it is frequently difficult, and sometimes impossible, to recognise in the older authors many of those now commonly admitted. Thus it is usual to enumerate among the diseases known only to comparatively modern times, laryngitis, cynanche trachealis, and bronchitis, hydrothorax, pyrosis, gonorrhœa, lues venerea, rubeola, scarlatina, varicella, miliary fever, variola, frambæsia, neuralgia, rachitis, angina pectoris, dyspepsia, chlorosis, delirium tremens, chorea, and numerous others; but it is highly probable that most of those diseases

have been considered new, only because they have been recently presented under new names and new aspects; because a more minute investigation of their symptoms has given rise sometimes, on the one hand, to a splitting of one disease, as formerly described, into several, to each of which a new name was applied (for example, rubeola, scarlatina, variola, all which were formerly included under the vague head of pestilential fever), and sometimes, on the other, to the clustering together of several, formerly described separately, and including them all under some term, of which there is no trace in any early author. The former practice, however, has been much more common than the latter, and hence it follows that the number of diseases, as enumerated by Hippocrates, must be comparatively small, and that they must have progressively increased and multiplied as they passed through the hands of his successors down to our own time; but we should nevertheless hesitate before we chime in with the common cry, that, of "all the thousand ills that flesh is heir to," a great proportion belongs exclusively to this unfortunate age. It is of a piece with the childish propensity to believe that the ancients were more long lived, taller, and stronger than we are. All the ambiguity, however, could never have happened had diseases been from the first (which perhaps was impossible) arranged and enumerated upon the principle of their proximate cause alone, composed, as it is, of a certain morbid change, structural or functional, in a certain organ. But now that we have so much better data to proceed upon, it is surely inexcusable to follow any other plan. It is in having given us these data that pathological anatomy (little as it has till lately been cultivated) has been already eminently serviceable to medicine, and promises to be every way more and more so, now that the irrational mummery of systematic nosology, by which it has so long been obscured, is rapidly fading away.

CHAP. XI.

NATURAL TISSUES IN EXCESS, AND SOME PRETERNATURAL TISSUES.

INDURATIONS — HYPERTROPHIES — POLYPI — TEETH AND HAIR — OSSIFICATION—HYDATIDS—WORMS—MODE OF THEIR FORMATION —FALSE PARASITES.

An induration differs from an hypertrophy chiefly in this, that the former consists in an increase of density without increase of bulk, and the latter in an increase of bulk without increase of density; they are, however, very frequently combined together. In both cases, it is not the cellular tissue alone which is superabundant, but more or fewer of the other tissues also of the organ affected. With respect to hypertrophy, the increase of bulk may be in any direction; and, in this view, the lengthening and increase of size of the arteries which feed the uterus during gestation, and the mamma and its ducts during lactation, as well as the enlargement of both, but particularly of the uterus, during the former state, may be considered, as has been already said, as a kind of healthy hypertrophy, and as arising, like all hypertrophies, from some degree of inflammation. This is the cause of the tortuosity of ducts, produced by retention of their contents; also of that of the arteries feeding tumours, &c. of various veins.

When the hypertrophy of a canal or cavity con-

sists of increase of area alone, otherwise than in the longitudinal direction, its effect is necessarily to dilate this canal or cavity; if it consist of increase of thickness alone, its effect is either to leave the canal or cavity of the same size as before, or to constrict it, according as the hypertrophy is either eccentric or concentric; lastly, if it consist of an increase of both area and thickness, its effect is either to enlarge, to constrict, or to leave unchanged, the canal or cavity, according to circumstances. If the hypertrophy ot a canal is concentric, it produces a stricture, as in the apertures of the heart, arteries, &c.; but such strictures are produced occasionally by granulations, and tumours of an annular or tubular form, analogous to polypi growing from the inner surface of the canal in question.

A true polypus, the vascular sarcoma of Mr Abernethy, which affects only mucous membranes, or the lining of the veins and heart, particularly on the right side, is a fleshy tumour, more or less compact, generally of a pyriform shape, and suspended by a narrow neck from the surface from which it grows. Sometimes it is of a fungous appearance, or in the form of an expanded membrane, analogous to the membrana decidua which lines the uterus during gestation.

Till within the last few years, all the foregoing examples of preternatural depositions were confounded together; and it is not yet quite settled whether they are all the result of previous inflammation, a fact which has been questioned lately by Meckel, Andral, Gendrin, and many others. Many reasons have been adduced, "en passant," for believing that, in the great majority of instances, this is certainly

the cause of them; and when the contrary seems to be the case, it appears to us that the dispute is rather about words than facts, and arises entirely from the different definitions which may be given of the word inflammation; that minor degree of it which frequently gives rise to these new depositions being distinguished by the French usually by the name of "irritation;" but the difference is in degree only, not in kind. Another example of the deposition by inflammation of healthy tissues, not only in excess, but in preternatural situations, is that of teeth and hair, which, when so deposited, are commonly found together, the former generally upon pulpy bases, enclosed in a distinct capsule, as in the progress of natural dentition, and the latter generally matted into a mass by a quantity of sebaceous fluid.*

The simultaneous existence of teeth and hair in these situations seems to afford *a priori* a singular evidence of their analogy, which has been before insisted on; the

* [These depositions have been met with in various organs. The hairs have been found chiefly on the mucous membranes; they are generally attached by distinct roots, and the membrane to which they adhere assumes all the characters of true skin.—(Cruveilhier; Gooch, Med. and Surg. Observations, Lond. 1773, p. 114; Cormack, Monthly Journal of Med. Science, 1840, vol. i. p. 457.) When occurring in the lower animals, they always resemble the hair of the animal in which they are formed.—(J. F. Meckel, Journ. Complém. du Dict. de Méd. vol. iv. p. 122.) They are also said to lose their colour and become gray, like the hair of the head.—(Wepfer.)

The teeth are seldom met with alone, but are almost always connected with masses of hair. They have been found in tumours in eye-socket (Barnes, Med. and Chirurg. Trans. vol. iv. No. 18, p. 316), in stomach (Ruysch, Hist. Anat. Méd. dec. iii. No. 1, p. 2), in ovaries and uterus (Sampson, Birch, Tyson, Phil. Trans. No. 150.)]—EDITORS.

action of the vessels by which both are secreted being apparently almost identical, and the same as that by which, on the mucous tissue, the one, and on the dermoid tissue, the other, are naturally deposited. This preternatural deposition did not attract much attention till about the time of John Buchan; and from such teeth and hair being found chiefly in the ovaries, they were generally attributed to a misconception. This, however, turned out to be a misconception of the affair, and, to say nothing of their being the only parts of the supposed fœtus which were found, they were soon afterwards found, not only in females after coition, but in virgins,—not only in the ovaries, but in divers other organs,—and not only in females, but in males. It has been lately said by Bremser, that these *pretended* teeth, as he calls them, are probably nothing more than hydatids which have become calcareous; but this explanation will not readily apply to the hairs in which they are so commonly found enveloped, and seems to be farther opposed to the fact, that they are generally precisely similar to the teeth as found in the gums, whether such preternatural deposition has taken place in man, or in the lower animals, which are equally liable to them.

Other examples of healthy tissues deposited in excess, as the result of inflammation, are those by which the opposite surfaces of serous sacs are affected, which are united generally by cords of various lengths intersecting each other in various directions, so as to represent an intricate lattice-work. These cords being, unlike the last-mentioned tissues, themselves organized, are of course liable to a secondary inflammation

and consequent suppuration, to which they are more prone than the membranes which they unite, in conformity to a law universally admitted, and to which we shall have occasion to refer in future, that parts last deposited are most prone to every description of morbid change, perhaps from being less perfectly organized.

The last deposition of healthy tissues, as the result of inflammation, which remains to be mentioned, is that of cartilage or bone, which may take place in patches, either circumscribed, or so diffused as to assume the form of the organ in which they occur, or in the form of flattened or fungous tumours projecting from these organs.

It is questionable, however, whether, in most of the instances of reputed ossification of soft parts, it is not rather a calcareous deposit within or upon them, than a generation of true organized bone; in other words, whether this deposition do not belong to the head of calculi rather than ossification. At any rate, we know that they are very seldom the seat of a secondary inflammation; and in all such situations, both the cartilage and reputed bone are destitute of a proper perichondrium or periosteum. The regeneration of bone however in necrosis, as well as its excessive deposition in hyperostosis, exostosis, anchylosis, as effected by the vessels of the proper osseous tissues, is a very different affair.*

* [In almost all the permanent cartilages, when ossified, whether in youth, or middle or old age, *true bone*, with its canals and laminæ, is formed. (Miescher de Ossium genesi, structura et vita, Berl. 1836; and J. Müller in Poggendorff's Annal. 1836.)

In speaking of preternatural tissues as resulting from inflammation, we shall begin with hydatids and

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Miescher in five and Valentin in eleven cases of ossification of the dura mater, found true organized bone. In one case of reputed ossification of the falx cerebri, he found for the most part a granular substance, but at points, true ossification.

In the eye, likewise, the hard concretions are sometimes bony. In one case of concretion in the eye, apparently springing originally from Jacob's membrane, but of great thickness, he found true bony canals ramifying and anastomosing with one another.

The development of these abnormal true bony concretions is various: 1st. They may arise by threads of solid matter lying parallel to one another, as in the case of the eye; 2d. from a granular basis, as in the case of the dura mater referred to; or, 3d. the bone may be preceded by a true cartilage. The concretions in the muscles and sinews, which occur more particularly in horses, are also true bone, according to Miescher's as well as Valentin's observations. Great care however is required, in their examination, to detect their true nature.

These concretions seem first to be formed of a granular substance; later there appears in the granular substance true bony deposition, which gradually spreads so as to occupy the whole mass.

Although many concretions that occur in various tissues are not true bone, yet they have a certain organization. The basis is throughout a clear, lamellar, granular mass, in which the calcareous matter is deposited according to fixed laws. There are three modifications of this process.

1st. The inorganic calcareous deposits appear in separate dark points, as if they had been laid down interstitially in the previously formed granular substance; or,

2d. There appear round, flat bodies, transparent in the middle, dark and opaque in the circumference, and of a clear black ground. From the periphery of these bodies twigs run into all the neighbouring interstices. The ultimate twigs of two neighbouring bodies anastomose freely, in a manner similar to the finer blood-vessels. Or,

3d. There appear dark bodies of an undefined form, whose ramifications spread on all sides.

In the so-called ossified bronchocele, when the disease has a malignant form, the character of the deposition is also materially changed. In the highest grade of this formation the deposited material has no

worms, partly because we have already presumed that the formation of all such tissues depends upon the deposition of a portion of coagulable lymph, containing within itself the rudiments of its own organization (so that the independence of this as a distinct animal seems to be, not a more complicated, but a simpler order of formation, than that by which it contracts adhesions with the neighbouring parts), and partly because it has been presumed, by very high authority, that the formation of many others is always preceded by the deposition of hydatids, which are subsequently converted into them. Hydatid is a familiar term by which we signify several kinds of animals belonging to the class vermes, the order intestina, and the family cystica. As found in man, these belong to two genera, the cysticercus, and echinococcus, the former of which is comparatively very rare. Their size varies from an orange to that of a pin's head, and they seem to be composed of two coats, the external of which is muscular and the internal fibrous, and filled with a coagulated fluid, generally of a gray colour. All the cystica are deficient, to all appearance, both in diges-

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organic basis of support, and is found in the form of an aggregation of small round bodies.

There also occur unorganized deposits, that have no trace of organic basis. These, however, present certain constant varieties. 1st. They are throughout crystallized, and are either uniform or manifestly composed of a combination of smaller crystals or lamellar plates. These varieties are found in urinary and biliary calculi. 2d. The mass may be apparently granular, friable, and show throughout no trace of crystallization or regular formation. The whole of this mass, which seems amorphous to the naked eye, is seen, when viewed by a microscope, to be composed of rhomboid pillars or tables. (Valentin's Repertor. 1837, 1st vol., 3d and 4th parts.)]—EDITORS.

tive and genital organs. The cysticercus cellulosus has a small retractive head, with four suckers, and a minute oval body, terminating in a large vesicle, which constitutes the bulk of the animal, but which is in fact only its tail. Perhaps the best way of exhibiting the head of these animals when separated from the body, is by pressing them between two plates of glass, by which means the reflexion of membrane by which the head is concealed is unfurled. The echinococcus appears to consist almost exclusively of the vesicle above mentioned, to the inner surface of which, at first, adhere numerous minute animals of the same description, which, becoming subsequently detached, swim freely in the fluid which it contains. Hydatids are commonly enclosed in a cyst formed of condensed cellular tissue, and are in general distinct from each other, and from the cyst in which they are contained; but sometimes they adhere either together by their external surfaces, or to their surrounding cyst.* The hydatids found in the human body have been known from a very early period, but they were not acknowledged as animals till the time of Hartman, Malpighi, and Tyson, the last of whom described them as worms labouring under dropsy. These views of their nature, however, attracted at first but little attention.

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* [The echinococcus usually met with is composed of an external yellow, coriaceous, sometimes crustaceous tunic, and an internal transparent, firm, gelatinous membrane. On the external membrane small grains are generally scattered, which probably give to it the opaline appearance it presents. (Cruveilhier, Dict. de Chirurg. Prat. art. Acéphal.) Another species of echinococcus, found in the urine, is described by Müller. (Archiv. für Physiol. (Jahresbericht), 1836.) The tunic of the cyst consists of a thick, white, membrane,

By Ruysch, who latterly made almost every thing consist in minute blood-vessels, they are described as extremities of such blood-vessels which have changed their original nature, and degenerated into a vicious structure. Hartman's view of the matter was, however, renewed by Linnæus, who was equally fond of making out every thing an animal; and again by Pallas, who was the first to discover their heads.

By subsequent writers, the animal nature of hydatids was again questioned by Lieutaud, who supposed them to consist of distended lymphiferous vessels; by Cruickshanks, who represented them as distended cells of the conglobate glands; and by Portal, who described them as consisting of distended cells of cellular tissue. By Dr Baillie, those found in some of the organs of the body, as the liver, are admitted as animals, while those found in others, as the kidneys, placenta, &c. are denied to be such. The modern opinions on the subject, that they are all animals such as above described, have been established principally by Rudolphi and Bremser. The various theories respecting their formation will be alluded to when on the subject of worms properly so called.

By the term worms we signify several distinct species of animals belonging to the class vermes, the

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not divided into laminæ: some of the animalcules were enclosed in small vesicles.

Besides these, another species was discovered by Professor Owen in 1835, the trichina spiralis. This is cylindrical and filiform, terminating obtusely at both extremities: the orifice is situated in the centre of a transverse mouth. It is enclosed in a cyst of about $\frac{1}{80}$ of an inch in length, and $\frac{1}{100}$ in breadth. It has been found hitherto only in the voluntary muscles, and among these chiefly in the superficial. It seems wholly unconnected with the age, sex, or habit of body of the individual. (Zoological Trans. vol. i. p. 315.)]—EDITORS.

order intestina, and the three families nematoidea or cylindrical worms, trematoidea or oval worms, and cystoidia or flat worms. The first family includes, among numerous others, the six genera hamularea, ascaris, trichocephalus, oxyurus, strongylus, and filarea; the second, the two genera distoma and polystoma; and the third, the two genera bothriocephalus and tænia; making in all ten genera of worms (without including hydatids), most usually found in man. Of these, all the nematoidea have their digestive organs distinct, and are male and female. The trematoidea and cystoidia, on the contrary, are nourished by pores, and are hermaphrodites. With respect to the individual species, there is but one in each genus found in man. The hamularea has an obtuse head, with two little hooks below, and a somewhat compressed body of a dark brown colour: it is found in the bronchia alone. The ascaris lumbricoides has a triangular mouth between three projecting vesicles, a pointed head, and smooth grooved body of a pale-red colour, and a blunt tail, with a transverse anus at some distance from the extremity of its tail, and is commonly from seven to fifteen inches long. In most of these respects it differs from the lumbricus terrestris, which has but one vesicle at its mouth, a bristled body of a dusky-red colour, with the anus at the extremity of a flattened tail: it is found in the small intestines principally of children, but is not common in infants before weaning. The trichocephalus dispar has a round mouth and hair-like head (at first mistaken for its tail), an uneven body striated anteriorly and about the thickness of a pin, and a blunt tail, and is about

two inches long:* it is found in the caput cœcum coli, and few persons are without it. The ascaris vermicularis has a round mouth between three projecting vesicles, a nodose head, a wrinkled body, and a somewhat tapering tail, and is generally about half an inch in length: it is found in the rectum of children and old people. The strongylus gigans has a rounded or annular mouth and head, and the tail narrower than the body, and the latter terminating in a point. This species is developed in the parenchyma of the kidney, and occasionally attains the length of three feet, and diameter of half an inch: it is frequently discharged with the urine. The filaria medinensis (dracontium, dracunculus, guinea-worm) has a round mouth, and head of the same thickness as the body, which is smooth, and sometimes not thicker than a hair, though frequently some feet in length.† Among the trematoidea, the distoma hepaticum has an anterior and ventral opening, by which it attaches itself like a leech, and a body of a brown colour, half an inch long. It is found in the gall-bladder and ducts, but is very rare in man. The polystoma pinguicola, on the contrary, has six openings anteriorly, besides a ventral and a posterior opening: it is found in the fat of the ovaries. Lastly, among the cystoidia the bothriocephalus latus

* [The capillary portion of this species makes about two thirds of its entire length; the thick part of the body is spirally convoluted on the same plane. (Owen.)]—Editors.

† [It is met with in the subcutaneous cellular texture, generally in the lower extremities, especially the feet, sometimes in the scrotum, and also, though very rarely, beneath the tunica conjunctiva of the eye. (Owen.)]—Editors.

(old tænia lata) has an oval-shaped grooved head, without horns, a broad jointed body with short articulations, and pores on its flat surface, and a forked tapering tail, and is generally about twenty feet long; while the tænia solium has a square horned head, a narrow jointed body with long articulations, and pores on its margins (by which it attaches itself, as some plants by their suckers), and a rounded extremity, and is sometimes a hundred feet in length.*

In the lower animals the number of species of worms commonly found, including hydatids, is in general somewhat less than in man; among fishes, for instance, the salmon being liable to eight, and the perch to seven; among reptiles, the frog being liable to eight; the crow, and birds in general, to about seven; and among the mammalia, the hare to eight, the fox, hog, horse, and sheep to nine, and the ox to eleven, and each of these animals, like man, having not only its own distinctive kinds of worms, but each kind confined to its own particular organ.

With respect to the origin of parasitical animals in general, and particularly of intestinal worms, it was supposed by Hippocrates and his immediate followers that they were nothing but slips of abraded intestines, which had in some way or other become vivified; while by the earlier pathologists, after the revival of literature, they were considered as merely phlegm, or mucilage, or some other fluid, vivified by either the natural heat of the body—a spark of the πυρ καθαρσιον—

* [They are both found in the intestines of adults: the former is confined to the inhabitants of Russia, Switzerland, Poland, and some parts of France, while the latter is common to all the other inhabitants of Europe. (Bremser.)]—EDITORS.

or soul of the world, or by that generated by putrefaction.

Against either of these opinions it is quite unnecessary to contend. Among the moderns, five opinions have been principally in vogue; first, that they are always received with the aliment, &c. in the form of ova deposited by animals, the natural habitat of which is without; 2dly, that they are always received indeed in the form of ova, but that these ova are those of the proper entozoa of man, previously passed from persons affected; 3dly, that having existed in the first parents of all animals, the ova are passed either to the fœtus along the cord, or to the infant with the milk; 4thly, that such ova are originally contained within the ovum of the human body, and developed as each organ of the latter is developed; and, 5thly, that they are in each instance generated spontaneously, as the result of secretion, owing to inflammation, or some analogous process.

The 1st opinion has been maintained by Leeuwenhoeck, Harder, Linnæus, Andry, Boerhaave, Hoffman, and recently by Brodie, Barry, and Good; the 2d by Pallas, Reinlein, Brera, Rhind, &c.; the 3d by Valisnieri, Goeze, Bloch, Verner; and the 4th by Haller and Bonnet, &c.; and the last, although foolishly regarded by some "almost as a blasphemy," has been adopted by Rudolphi, Bremser, and the greater number of modern zoologists. It is well remarked by Carminati, that a man of ingenuity may maintain any one of these opinions, and in general satisfy his audience that he is in the right; but there can be but little question, upon deliberate reflection, but that the last is by far the most tenable. Against

the notion that they enter, in the form of minute ova, with the food and drink, and are directly hatched in the intestinal canal, it is with great reason objected, 1st. that such worms are unlike any found in other situations, and that the difference cannot be ascribed to the different habitat; 2d. that they are found in fœtuses and sucking babes; 3d. that they are found not only in exposed passages, but, it is asked, how should each be found in its own spot, and nowhere else?

Against the 2d hypothesis, which answers indeed the 1st objection to the original hypothesis, there still remains the 2d, that they are found in fœtuses and infants. There remains also the 3d, that they are found not in exposed passages alone; and the 4th, that each is found only in its own organ. Besides, how are they sometimes epidemic, if there is always only a certain number of them in existence,—and why should they not be most prevalent in cities?—(Bremser.) Such ova have also been given with the food in vain—(Schreiber.) Against the 3d, which answers indeed the 1st, 2d, and 3d objections, there still remains the 4th, viz. that each is found in its own organ, their occasional epidemic character, and occurrence in middle or advanced life.* The 4th, which answers indeed the 1st, 2d, 3d, 4th objections, besides being exposed to all the other objections advanced

* [Against the idea of their being transmitted by the parent to the offspring, and consequently all having been present in the first parent, Bremser quaintly observes, "The polycephalus cerebralis is found almost only in lambs, and is always fatal; if the first created lamb had had it, it must have died before propagating, and we should have eaten no mutton, and seen no polycephali."]—Editors.

against the one immediately previous, is altogether a most unwarrantable extension of an hypothesis already beyond all bounds wild and extravagant. It seems most reasonable, therefore, to conclude that such animals do not result from ova at all, but are secreted *de novo* from the blood in the capillary arteries of each organ in which they are respectively found, and that their character therefore everywhere varies, in the same manner as the other secretions of these organs. When on the subject of generation, we endeavoured to render it probable that the formation of the ova in the ovaries could be regarded only in the light of a secretion; a fact which becomes sufficiently obvious when we contemplate the strict analogy which exists between the ova of the most perfect animals and the germ of those which are the least so. This germ of the polypus is obviously a part of the animal itself, and as certainly the product of secretion as any other of its organs. It constitutes at first a limb of the animal, and is only subsequently thrown off when endowed with individual existence. In all these circumstances, the ovum of the human body strictly corresponds with it; and if we admit that the ova of the most perfect animals are thus the products of the secretion of the ovaries, we must *a fortiori* admit the possibility of animals so much less perfect being in like manner the product of the secretions of other organs of the body, each of which is perhaps capable of forming its own living tissues, which are susceptible in like manner of an independent existence. Nay, it appears, as before said, that the production of parasitical animals may be considered as even a simpler process than that of new tissues in general, since,

presuming that each of the latter is first deposited in the form of organizable lymph, containing within itself, from the first, the rudiments of its own future structure, and therefore capable of an independent existence, it implies a more complicated process to produce adhesions between this and the parent animal than to leave it in possession of its individuality. The objection to this doctrine, founded upon its implying a power of creating life, need not again be adverted to. It could never have been urged had the real nature of life been understood. Animals can *create* nothing, but they can form of ultimate elements certain new compounds endowed with irritability; and such irritability, when acted upon by appropriate stimuli, gives rise to the display of all the phenomena in which alone life consists. Assuming, then, that these parasitical animals are the product of secretion, it follows, consistently with what was already said, that we must regard them as one of the numerous terminations of inflammation; and not only analogy, but the numerous morbid symptoms which are known to precede and attend their development, seem to be strongly in favour of this opinion. Numerous instances are mentioned by Bremser and others, in which hydatids have been found in organs which have suffered severe contusions; and it is extremely probable that the morbid phenomena commonly attributed to the presence of these animals are the result, not so much of their *presence*, as of that state which preceded and perhaps accompanies their formation. The same thing may be said of intestinal worms, that they are not the *cause* in general of any bad symptoms, but the effect of that state of the intestinal canal which gave rise to their

formation; and that the symptoms which we commonly ascribe to worms ought really to be ascribed to the gastro-enteritis from which the worms resulted. It is strongly in favour of this opinion, moreover, that almost precisely the same symptoms which in childhood are ascribed to worms (because in this period inflammation of the intestinal canal has very frequently this result), are in adult age set down as marks of gastro-enteritis. It is perhaps not true, as supposed by Goeze, Abilgard, and others, that intestinal worms are rather salutary than otherwise; though we seem to be quite justified in adopting the opinion of Bremser (unquestionably the best practical helminthologist of the present day), that their presence produces very little irritation.* We must not leave the subject of parasitical animals without remarking, that many of these frequently reported to have been voided from the stomach, urinary bladder, uterus, &c. as well as those found about the eruption of scabies, and otherwise about the integuments of the body (with the exception of the guinea-worm), have no reference to the subject now under consideration, since they are not the result of new secretions arising from inflammation, but of ova accidentally received into the parts in question. Of this nature are the larvæ of the common fly, the moth, and the dragon-fly, as well as black beetles, spiders, leeches, snails, frogs, toads, and even lizards, all of which have been represented on good authority as occasionally voided from the

* [Bremser observes that he has known very few bad effects arise from the presence of worms, but a great many follow the administration of medicines for their expulsion.]—Editors.

stomach. So also the strongylus gigus, or proper urinary worm, must not be confounded with the larvæ of flies and beetles, and other similar animals, which are sometimes voided by the urethra.*

* It is not necessary to take particular notice of the live dragon-flies, scorpions, tortoises, and magpies, which Schenck reports as having been sometimes passed with the urine. But, of all organs, the uterus has been most honoured by the habitation of this sort of gentry; and we have already alluded, under the head of generation, to the numerous accounts of polypi, echini, caterpillars, leeches, cray-fish, muscles, tenches, frogs, land-serpents, lizards, moles, hares, cats, dogs, pigs, lions, and even elephants, sometimes expelled from this organ. In some of these instances, as has been already remarked, unformed monsters, bearing some rude resemblance to the animals in question, may have been the result of misconception; but in the majority of them there can be but little doubt that they were either mere polypi, or produced in the manner above supposed. The occasional presence of mites in and about the pustules of scabies was noticed by Avenzoar, and subsequently by Ingratius, Joubert, and others; and the particular nature of the acarus scabei was ascertained by Bonomo in 1683, and it has since been described by Wickmann, Alibert, and others. Their origin is obviously the same as that of the other animals now under consideration; and the same is true with respect to the lice also found between the hairs of the eye-lashes (the phthiriasis of the ancients), and below as well as above the cuticle in general, the reputed cause of the death of Plato, of Ennius, of Sylla, of Herod, and many other highly respectable men of ancient times. Numerous remarkable instances, also, of the presence of lice below the cuticle, sometimes separately, sometimes gregarious, in kinds of blebs, have been related in more modern times, from Ingratius down to Heberden; but one of the most remarkable is mentioned by Zacutus, in which it is said that two black servants had enough to do to carry out all the lice which were begotten on their master, a Portuguese gentleman, into the sea. It is very generally understood, also, that the members of a certain noble family in this country are afflicted in a similar manner. This can be accounted for only by supposing that in these instances there exists a condition of the cuticle and of the secretions of the skin particularly favourable to the reception and development of ova, perhaps always floating in the air, but not coming, under any other circumstances, to maturity.

With respect to the animals sometimes found in the veins, they are really, perhaps, of this character, for the following reasons: 1st. They are often recognizable as larvæ of well-known insects; 2d. they are never found in fœtuses or infants; 3d. they are not indeed confined to the intestines, but are most frequent in the veins directly leading from the vena portæ; 4th. they are seldom twice alike, which the proper entozoa of these parts should be. From their size, they will probably always remain in the vein in which they were at first developed (vena portæ), but may pass in the state of ova throughout the whole arterial system.

CHAP. XII.

TUBERCLE—CANCER—[TYPHOUS MATTER].

TUBERCLE—MODE OF FORMATION—[PRIMARY SEAT OF TUBERCLE—CURE OF TUBERCLE—ACUTE TUBERCULOSIS]—ENCEPHALOID TUMOUR—MELANOSIS—SCIRRHUS—[TYPHOUS MATTER].

Of the other morbid tissues resulting from inflammation, the principal are, tubercles, encephaloid tumours, melanosis, and scirrhus. A tubercle appears to be an organized mass. In its first or indolent stage (when it is considered by Laennec and Louis as identical with what is called a miliary granulation, though this is denied by Bayle and Andral) it is small, semi-transparent, of a moderate hardness, a grayish or brownish colour, and uniform texture, without apparent vessels;* in its second or crude stage (that is, when inflamed) it is larger, opaque, softer, and interspersed with yellow points; and in the third, or ripe stage (*i. e.* when it has gone on to suppuration), it becomes soft like cheese, first in its centre, and gradually degenerates into an imperfect kind of pus.†

* [Gluge (Anat. Pathol. Untersuch. p. 114) observes that the tuberculous mass appears first as a coherent mass consisting of very small dark particles, and wholly unorganized: it includes in general the rudiments of vessels.]—EDITORS.

† [With respect to the cause of this softening, and the mode in which it takes place, Laennec (p. 430) and many others hold that they soften of themselves; that as tubercle is a new and independent

Tubercles are sometimes collected into heaps comprising from three or four to many hundreds; and, as before observed, it is the tendency to the deposition of this tissue, as the result of inflammation, which constitutes what is commonly called the scrophulous diathesis,* supposed to be more common in the young and sanguine than in others. This tissue, like the chords forming adhesions, and all other newly depo-

growth, its softening is nothing more than a natural consequence of its death. This opinion is adopted by Lobstein (Traité d'Anat. Path. 1829, t. i. p. 471), who seeks to strengthen it by pointing out the resemblance of tubercle to fungus medullaris and other similar morbid growths, which he calls kakoplastic, and which have an innate tendency to spontaneous softening. On the other hand, Lombard, Lallemand, Gendrin, Andral, and Carswell, are of opinion that the tubercle, acting like a foreign body, excites a secretion of pus, in which it is dissolved. Laennec, Lobstein, and Meckel believe that the softening begins at the centre, and spreads to the periphery; but Carswell holds that it most frequently follows the contrary course. Andral and Sebastian reconciled the two opinions, by believing that the softening sometimes took place in the one, sometimes in the other of these ways. (Cerutti, Collect. quædam de Phthis. pulm. tuberc. Leipzig, 1839, p. 13 et seq.) According to Rokitansky, the discrete tubercles begin to melt at the centre, but the conglommerate tubercles begin in several points corresponding to the centre of the granular tubercles, of which they are composed.] —Editors.

* [Laennec believes that, from numerous observations and experiments, he can place it beyond a doubt that the origin of tubercles depends upon a universal diathesis of the body. This opinion is adopted by Baron, and corroborated by the fact that they are almost always found to occur in several organs simultaneously. Macartney of Dublin and Alexander Thomson (Lond. Med. and Surg. Journal, Dec. 1833) believe they have detected, by injection, the proper vessels of tubercles. Professor Hyrtel of Prague is said to have also a similar preparation. Others, however, among whom are Stark, Baillie, Meckel, Lobstein, Andral, Gendrin, Lallemand, have attempted with the utmost care to inject them, but have not been able to find vessels.]—Editors.

sited parts, when organized, is more liable to inflammation than the original healthy tissues, and the inflammation which it undergoes is, as before observed, of the scrophulous character.

The mode of formation of tubercles has been as variously described as that of worms. By Hippocrates, followed by Fernel, Sennert, and others, they were represented as merely petrified phlegm or mucilage. A similar opinion of the inorganic nature of tubercle has been followed recently by T. Reid, Ruysch, Lombard, Lloyd, Andral, Cruveilhier, and Chambers. Galen looked upon them as cicatrices of blood-vessels ruptured by hæmorrhage. De la Boe, Morton, Wepfer, Heberden, Portal, and lately Broussais, have represented them as merely conglobate glands; while Beddoes considers them as analogous to these glands, but not identical with them.* Dr Baron, following a suggestion of Jenner, considers them as nothing more than transmuted hydatids;† while Laennec, Louis, Roch, Bouillaud, and Magen-

* [Nasse (in Rust's Handbuch der Chirurg. bd. xvi. p. 439), following a hint of Sydenham's, maintained it to be merely a scrophulous state of those glands. However, Hewson and Reid have demonstrated that the proper substance of the lungs contains no such glands.]—Editors.

† [Carmichael of Dublin (Essay on the origin and nature of Tuberculous and Cancerous Diseases) maintains that they are nothing but acephalocysts; and that this opinion of their being a species of hydatid is not altogether new, could be shewn by consulting some of the oldest writers; at least Schenck, who wrote in 1665, speaks of worms in the lungs being a common cause of cough, and sometimes coughed up. (S. Observat. Med. rarior. l. v. de Pulmonibus, p. 229.) This opinion has been satisfactorily refuted by Andral, Nasse, and Sebastian. (Cerutti.)]—Editors.

die, Cruveilhier, Carswell, and their followers, consider them, not as mere mucilage, or any other inorganic matter, nor scars of blood-vessels, nor conglobate glands, nor degenerated hydatids, but a perfectly distinct organized tissue, the result of a new secretion. The frequent co-existence, indeed, of hydatids and tubercles, particularly in the lower animals, was very likely to give rise to the belief that the latter resulted from the former; but it appears infinitely more likely that they are simultaneous results of different degrees of the same inflammation in any organ, rather than that the one is a transmutation of the other; and accordingly it has been found by Dupuy and Andral, that a deposition of tubercular matter often occurs around hydatids* (in the same manner as the calcareous phosphates are often deposited round a nucleus of lithic acid), and that such hydatids are sometimes absorbed to make room for it. Nay, it is not improbable that the irritation occasioned by the pressure of hydatids (although perhaps not very considerable) may be sufficient to excite such a degree of inflammation as to give rise to the deposition of tubercles, in the same manner as the deposition of globules of mercury in various parts of the body is sufficiently well known to do. So early as the year 1694, it was found by Mr Clayton, that an injection of mercury into the veins gave rise in various parts to the deposition of tubercles, in the centre of each of which a globule of mercury was always found; and this experiment has been since

* [It will be observed, by reference to note, p. 151, that the combination of tubercles and hydatids is extremely rare.]—Editors.

repeated by Saunders, Gaspard, Nasse, Cruveilhier, Kay, and others. So also, if mercury be injected into the lungs of a rabbit, each globule will soon be found coated with tubercular matter.* The natural contents of a hydatid, as shown by Dr Abercrombie, are essentially different from the ingredients of a tubercle. With respect to the transmutation of hydatids, it has been already said that by Bremser they are described as being transformed, sometimes into calcareous matters, reputed teeth, and they were long ago mentioned by Ruysch as frequently converted into fatty tumours; but we have no evidence of their ever losing one form of organization to assume another, in the manner supposed by Dr Baron. Another question frequently agitated is, whether the deposition of tubercles (presuming them to be a secretion) be or be not the result of inflammation; Andral,† Lombard, Magendie, Cruveilhier, Drs Alison, Bardsley, and Tod, and others, believing that they generally are so, while Bayle, Laennec, Louis, Rostan, Gendrin, deny it; but, as has been before observed, the dispute appears to be a mere logomachia, and to hinge entirely on a definition. The state is identical, the degree may differ.‡

* [There is much doubt thrown upon these experiments by the researches of Sebastian (de origine incremento et exitu Phthisis pulmonum, Observ. Anatom.), who found that the substance deposited, when similar means to those used by Cruveilhier, &c. were employed, was plastic lymph, and not tubercular matter.]—Editors.

† [The recent observations of Andral on the state of the blood in phthisis, as seen at p. 87, support this view.]—Editors.

‡ It seems proper here to take some notice of the different opinions which prevail as to what tissue ought to be considered as the primary seat of tubercle, and in what form it is first deposited.

An encephaloid tumour (the next morbid tissue to be spoken of) is an organized circumscribed mass,

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Schroeder, v. d. Kolk (op. cit. p. 64), maintains that the origin of tubercles is from lymph deposited in the pulmonary cells, and asserts that, with the microscope, cells may be seen full of lymph, destitute of air, which gives the increased density to the parenchyma. Cerutti, however (op. cit. p. 16), could never find any thing of the kind, although he has often looked for it. Cruveilhier and Carswell believe them to be deposited in a semi-liquid form, like lymph. In one case, but only in one, Valentin was able most satisfactorily to convince himself that the deposition of tubercular matter took place in the cellular tissue connecting the blind ends of the bronchiæ.—(Valentin, Repertorium, 1837, bd. ii. p. 260.)

The following is the description of the seat and nature of the tuberculous deposit given by Rokitansky (op. cit. bd. iii. p. 122). Tubercles occur in the lungs originally in two forms, the first named by Rokitansky the *interstitial* tubercular granulation, and the second the tuberculous infiltration. The interstitial tubercular granulations are the well-known round, grayish, &c. bodies found discrete, or collected into heaps, scattered through the parenchyma of the lungs; their seat is in the interstitial tissue, between the smaller lobuli and the cells of the lungs, and in the walls of the cells themselves, that is, decidedly on the outside of the cavity of the cells. This is by far the most common form of tuberculous deposition.

The infiltrated tubercles are deposited *in the pulmonary cells* as the result of a process identical with the common pneumonia, except that the lymph deposited in the cells, instead of being absorbed or running into pus, becomes, from the influence of the tuberculous diathesis, the yellow tuberculous matter; thus constituting hepatization by means of a tuberculous product. This form is always the result of a very high degree of the tuberculous diathesis: it occurs most commonly in young individuals, and is attended generally with tuberculosis of the bronchial glands, and often with bronchial tubercles; and appears seldom as primitive tuberculosis, but comes on usually in the far advanced stages of interstitial tubercles.

It may be interesting to notice the natural processes by which a cure of tubercle is described by Rokitansky (op. cit. bd. iii. p. 148)

of a lobulated appearance; in consistence similar to the white matter of the nervous tissue, but of a red-

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as being effected. These changes take place in all stages of tubercles. 1st. *In their first or indolent stage*, under certain favourable circumstances, the tubercles may decay, shrink up, and be converted into an opaque bluish-gray nodule, of cartilaginous resistance, not susceptible of further change. The death of the tubercle, and changes above described, either take place in its entire substance, or are combined with the process by which the tubercle becomes calcareous. In the latter case it presents the appearance of a calcareous central mass, enclosed in a layer of transformed tubercle.

2d. In their second or crude stage, that is, the stage of incipient softening, or even after that is considerably advanced, they may be converted into a dark or light grayish pulpy mass, and finally hardened into a chalky concretion.

3d. After the cavity is formed, it may be healed by inflammation being set up in the surrounding parenchyma, by which this is converted, by obliteration of the air-cells, into a condensed fibrous layer of various thickness, while the inner surface becomes lined with a membrane resembling the mucous, or more rarely the serous. The cavern that has undergone these changes may be looked upon as a healed pulmonary ulcer; but the case may proceed further to perfect cicatrization. This occurs, when the cavern is not too large, by the gradual approximation, and final union, of its sides; and after this has taken place in the part which the cavern occupied, fibro-cellular bands are formed, on the surface of which the bronchia terminate in blind extremities.

In addition to the testimony of Laennec, Andral, Louis, Nasse, Carswell, Hope, Sir J. Clark, and many others, Rokitansky observes, "Tubercular pulmonary phthisis is beyond all doubt *curable* (ohne allen zweifel *heilbar*), as is demonstrated from observations by no means unfrequently made on the bodies of those, some of whom had previously suffered under more or less suspicious pulmonary affections, and had ultimately recovered. The investigation of the conditions under which such cures are effected by nature, is the only way in which we can hope to bring about a truly rational method of treatment, whose results will be the more happy, inasmuch as it must not be directed against the pulmonary ulcer for itself alone, but against the tubercular diathesis in general. For pulmonary consumption—the

der colour, and intersected by membranous septæ. Like the preceding morbid tissue, the encephaloid tumour is at first indolent, and may be quiescent for any length of time; but it is exceedingly liable to an inflammation, constituting the second stage, in consequence of which it is first softened, giving the sensation of an obscure fluctuation, and afterwards passes into an unhealthy kind of suppuration, constituting what is called soft cancer. This affection was known to the ancients under the last-mentioned name, and, as occurring in the bones, seems to have constituted the osteo-steatoma and the osteo-sarcoma or sarcosis of later writers, and, when combined with hyperostosis, spina ventosa and medullary exostosis. It was however described for the first time, though without

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tuberculous pulmonary ulcer—can only heal after the general disease, and along with it the local process which gives rise to the ulcer, has been eradicated. Under these conditions the pulmonary ulceration does really heal in several ways, as established by incontrovertible facts."

We cannot close the subject of tubercle without mentioning a very remarkable form of tuberculous deposition, which has hitherto almost entirely escaped observation, *i. e.* the acute tuberculosis. This disease consists in a simultaneous deposition of minute semitransparent tubercles, about the size of a pin's head, in both lungs, spleen, kidneys, and very frequently in the liver, the arachnoid, and other serous membranes. It is the product of a very high degree of the tuberculous diathesis. The deposition is attended by constitutional symptoms of a most violent character, bearing the closest resemblance to typhus, from which it is almost impossible to distinguish it: its course is equally rapid, and always fatal. It may attack individuals before perfectly free from tubercles, but generally occurs in the course of a more chronic form of tuberculosis. This very imperfect notice is all we have been able to collect, but the subject will be more fully treated in the work of Rokitansky, which is now in the course of publication.

a proper name, by Potts; and again, under the name of spongoid inflammation, by John Burns; from Mr Hey it received the name of fungus hæmatodes, and its history was fully detailed under that title by Dr Wardrop.

Its origin from inflammation also is pretty generally admitted, although by Dr Adams it has been supposed that it is produced by hydatids forming round themselves a fungous habitation, like insects in the gall-nut. To this supposition the same remarks are applicable as to the supposed formation of tubercles by similar means.

The next morbid tissue is melanosis, which consists of an organized mass, of uncertain form and size, sometimes encysted, opaque, hard, of an almost black colour (which it imparts to water on washing, it becoming itself gray), and in texture homogeneous, and without apparent vessels. Like the preceding tissues, it may remain indolent for an indefinite time; but it is liable, like them, to an inflammation, constituting its second stage, in consequence of which it becomes first softened into a thick, dark-coloured pulp, and ultimately degenerates into an unhealthy kind of suppuration, constituting what is called a black cancer. A tendency to the deposition of this tissue is sometimes equally well marked as a tendency to the deposition of tubercle, some very remarkable instances of which are related by Sir A. Halliday in the London Medical Repository for 1823, and subsequently by Messrs Cullen and Carswell in the Edinburgh Med. and Surgical Transact. 1824; and many similar cases have been since observed by Mr Faudington and others.

This morbid tissue, though long known as affecting the bronchial glands, was well distinguished and named, first by Laennec, and subsequently described by Bayle and Breschet. According to Laennec, it constitutes the first stage of the worst kind of cancer, and is subsequently an organized substance. Dr Wardrop speaks of it as undergoing the same process of disorganization as the encephaloid tumour, and Mr Faudington embraces a similar opinion; while by Breschet and Messrs Cullen and Carswell it is regarded as inorganic, and its soft stage is considered to be its first stage, and not the result of the suppurating process. The opinion of Laennec seems however to be most consistent with truth.

The last morbid tissue which comes to be spoken of is scirrhus, which consists of an organized, branched mass, of uncertain size, and in its first or indolent stage called occult cancer. It is semi-opaque, hard, generally of a grayish colour, but consisting of two kinds of substance, the one fibrous, opaque, and white, which forms bands shooting in various directions, the other shining, transparent, and of a greenish colour, contained in the cells or interstices of the former: it very seldom displays any vessels. It may remain in that state for an indefinite time, but is liable, from any exciting cause, to that variety of inflammation properly called scirrhous, in the course of which its surface becomes knotted with deep fissures, it acquires a leaden or purple colour, then becomes soft like a thick jelly, and ultimately passes into a malignant kind of suppuration, constituting a hard open cancer, which is known by its irregular fungous aspect, its inverted edges, and the peculiar character of its

discharge, which is frequently alternated with pure blood. The morbid tissues called scirrhosis, scaly scirrhus, &c. are probably only modifications of the above. It is the peculiar disposition of the body to form scirrhi, as the result of inflammation, supposed to be more remarkable in aged persons, and those of the melancholic temperament, which constitutes what is sometimes called the scirrhous or cancerous diathesis, a diathesis frequently as well marked as the scrophulous or melanotic.

According to Meckel, a true scirrhus always begins in mucous or sebaceous follicles. Exceptions however occur, although these perhaps are more frequently merely indurations: however, they are explicitly stated to arise in the *heart*, by Cruveilhier, Ollivier, Bayle, and Andral. They occur chiefly on the right side, in the membrane which is continued from the veins. The veins and thoracic duct are also liable to this deposition, according to Hodgson and Andral; the thyroid gland, and erectile tissue, which is chiefly venous, according to Desault; and the brain. Perhaps in the last situation they are indurations only, but they are stated explicitly by Bayle, Breschet, Andral, Travers, and Ollivier, to be true scirrhi. The true scirrhus constitutes the carcinomatous sarcoma of Mr Abernethy, but the term was properly restricted for the first time by Bayle.

With respect to the nature and formation of a scirrhus, it was considered long ago by Justamond as formed by the larvæ of insects, and by Dr Adams and Mr Carmichael it is supposed to be (like hydatids and worms) a kind of parasitic animal; and this idea, though at first sight very absurd, appears on reflec-

tion not very far from the truth, at least the connection of a scirrhus with the surrounding tissues seems to be far from intimate, and our power of acting upon it through these tissues so slight that we seem almost justified in considering it as endowed with an independent existence. The same observation may be applied perhaps to all the morbid tissues recently described; and it appears, as has been already observed, that we may explain in this way the very little control which we obviously have over these tissues, when morbidly affected, even by remedies which are most powerful in their operation on the healthy body. Dr Baron applies the same doctrine to the production of a scirrhus as to that of a tubercle, considering it merely as a transmuted hydatid; but into this question we need not again enter. It is denied by Gendrin and some others, that the deposition of scirrhus is always the result of inflammation; but here again, as elsewhere, the dispute appears to be "de verbo, non de re."*

* [After this description of tubercle, cancer, and the other morbid growths, we have now to notice one which the recent investigations of some eminent pathologists seem to entitle to a place in the same order; and the novelty as well as the importance of their view demands that we give a somewhat detailed account of it.

All are now familiar with the benefit rendered to pathology by referring the various phenomena of scrophulous and cancerous diseases to the deposition, and subsequent changes, of the peculiar morbid products—tubercle and scirrhus; and recent researches have rendered it highly probable that typhus ought to be admitted into the same category.

The opinion that in this disease there was a specific lesion, supposed generally hitherto to be confined to the intestines, has been adopted by many who have made the subject their special study,—more particularly by Louis and Chomel, the latter of whom observes,

after describing the typhous deposit in the intestines, "do not these facts remind us of another process just described, viz. the tuberculous?"

Schönlein also (Allgemeine Pathologie, 2d theil, s. 23) has given a very clear description, both of the appearances this morbid product presents, and of the changes it undergoes.

But it is to Professor Rokitansky that we owe the full development and distinct enunciation of this view, and from his work (op. cit. bd. iii. p. 238 et seq.) we have derived the following description.

I. The typhus process is characterised, in an anatomical point of view, by the deposition of a *peculiar morbid product*, which forthwith undergoes a distinct series of peculiar changes.

II. The seat of this process is various, and depends upon the specific relation of the general process to certain organs. The tissues most subject to this deposition are the mucous membrane and the lymphatic glands; and, in Austria at least, where the observations were made, the mucous membrane of the ilium (ilio-typhus) is most frequently affected; but it also occurs in the bronchia and lungs (when in this seat constituting most probably the exanthematic typhus), and also, though very rarely, in the colon (colo-typhus).

As the changes which this product undergoes are presented in their most characteristic form in the intestines, it will be sufficient to give a more detailed account of the process as it occurs in the ilium.

This process may be divided into four stages: 1st. The stage of congestion; 2d. the stage of deposition of the morbid product, *i. e.* typhous infiltration, which is, in respect to the degeneration, its crude stage; 3d. stage of intumescence, softening and throwing off of the degeneration; and, 4th. stage of proper intestinal typhous ulceration. The first stage corresponds to the period of irritation, and catarrhal and gastric symptoms: it exhibits a congested state of the vessels, or succulent condition of the mucous membrane, particularly of the villous coat, extending over the greater part of the ilium, but better marked at particular spots, especially near the cœcum. The mesenteric glands are slightly swollen, their vessels are gorged with blood, their substance soft and elastic, and their colour dark.

In the second stage the congestion moderates to a certain degree, and is reduced to several spots corresponding to the peyerian glands, and a few solitary follicles. Here it appears in the form of round elliptic "plaques," varying from half a line to three lines in thickness, which are formed by the deposition of a peculiar substance in the peyerian plexus and submucous cellular tissue. On a more close examination, the degeneration is found to be so deposited in the submucous tissue of the follicles, that the deepest layer of that tissue,

immediately covering the muscular coat, remains free from infiltration. It very seldom reaches beyond the bounds of the follicular apparatus.

The mesenteric glands are now more swollen, so as to reach the size of a bean or a hazel nut, blue or grayish red, tolerably consistent, and apparently infiltrated with lardaceous substance.

The commencement of the third stage is indicated by a return of the congestion in the ilium in a violent degree. The vessels, especially the veins, both in the mesentery, and in their ramifications in the intestines, are gorged with dark-violet viscid blood; and the tissue of the mucous membrane presents again a swollen appearance, more especially the villi, which yield a grayish-white turbid fluid on pressure.

But the most remarkable changes take place in the typhus plaques and mesenteric glands, which become spongy and turgescent. These changes may take place in either of the following ways. The deposit assumes the appearance of a grayish, marrow-like substance, and is then, along with the covering of the mucous membrane adhering to it, converted into a dirty yellowish-brown eschar, which, shrinking together from all sides, gradually loosens itself at the margin, splits up in various directions, breaks off from the deepest stratum of the submucous cellular tissue, and is carried off all at once, or by a repeated recurrence of the process: or the deposit degenerates into a loose, vascular, blood-streaked, bluish-red, luxuriant, fungoid structure, which becomes a special source of profuse intestinal hæmorrhages, and is generally thrown off piecemeal without scabbing.

The mesenteric glands now reach their greatest volume, attaining the size of a pigeon's, and, near the cœcal valve, not unfrequently of a hen's egg. Their substance is injected, tolerably consistent, but changes into a grayish-red loose pulp, frequently presenting the appearance of evident extravasation of blood: it is then soft and elastic, or frequently gives rise to the sensation of fluctuation.

In the fourth stage, after this deposition is thrown off, a loss of substance of the internal surface of the gut remains, which represents the proper typhous ulcer. It is unnecessary to go more into the detail of the appearance of these ulcers, which have been so frequently described, and are so well known. At this stage the morbid product has been thrown off, the mesenteric glands diminish forthwith in volume by the removal of the infiltrated morbid matter, but they remain still somewhat larger than natural, and retain a reddish colour, and their increased vascularity.

When the typhous process localizes itself in the bronchial mucous

membrane, the phenomena present a considerable difference. It appears always in the form of a diffused intense congestion, with dark-coloured swelling of the membrane, and copious secretion of a gelatinous, occasionally dark, blood-streaked mucus, and is principally developed in the bronchial ramifications of the inferior lobe. It appears therefore in this situation to be always arrested in the stage of typhous congestion, and never comes to any manifest production of that morbid product in the tissue of the bronchial mucous membrane, which is produced in such abundance in the follicular apparatus of the intestinal mucous membrane in abdominal typhus. Thus, in the primitive broncho-typhus the general affection is localized in the bronchial mucous membrane alone, to the exclusion of all the other mucous membranes, even that of the intestines with which the typhous process in general has the greatest affinity. In many cases, indeed, this latter exhibits a recognizable, but always subordinate, secondary affection of the follicles, in which the neighbouring mesenteric glands participate; and it would often be difficult to recognize the affection as typhus, were it not for the other attendant changes which mark the disease, viz. the peculiar engorgement of the spleen, and congestion of the pyloric extremity of the stomach, the condition of the blood, and the typhous nature of the affection in general, but more especially the change in the bronchial glands. This change is the same as that which the mesenteric glands undergo in ilio-typhus. They are swollen to the size of a pigeon or hen's egg, reddish-blue, spongy, friable, soft, and infiltrated with the peculiar typhus product.

This form is frequently combined with pneumo-typhus and typhus-pleurisy, and is undoubtedly the pathological cause of the exanthematic contagious typhus, and most probably also of the Irish and North American typhus, which commonly run their course without abdominal affection.

Sometimes the typhous affection of the lungs is better pronounced than that of the bronchia, but the former never occurs independently of the latter.

Besides these primary seats of typhous deposition, it may be deposited in many other organs as a secondary formation, giving rise to many complications, which, though very interesting in a practical point of view, would lead to too much detail were we to notice them here.

III. The typhus matter has, even at its origin, but much more in the transformations it undergoes, the greatest analogy with the cancerous degeneration, and more particularly with the medullary cancer.

IV. The local typhous process is an inflammation, not however of a healthy character, but of a typhous character; and this unhealthiness is given, according to Rokitansky, by the peculiar diseased state of the blood.

Lastly. Rokitansky is of opinion, that when the local typhous process is not met with in the mucous membrane of the intestines, or in any other of the mucous membranes, it may have run its course in the blood without localizing itself at all.]—EDITORS.

CHAP. XIII.

CALCULI—DEPOSITION OF FLUIDS.

DIFFERENT KINDS OF CALCULI—THEORY OF THEIR FORMATION—INCREASE OF FAT—BRONCHOCELE—INCREASE OF MUCILAGE—CHANGES IN BILE—CHANGES IN THE URINE.

Before proceeding to speak of the fluid secretions which so frequently result from inflammation, a few words may be said of calculi in general, or the solid substances deposited from this cause which do not display any evidence of vitality. A calculus is an unorganized mass, consisting principally (though seldom or never of only one ingredient) sometimes of *earthy matters*, most of which are found not only in several of the natural tissues, as the teeth, nails, hairs, cartilages, and bones, but some also in many of the fluids; and sometimes of *animal matters*, most of which are found in particular fluids alone, as the mucilage, bile, stools, fat, urine, and blood.

Among the former we may mention silica, the phosphate of ammonia and magnesia, the carbonate and phosphate of lime, a mixture of the phosphate of ammonia and magnesia, with the phosphate of lime and the oxalate of lime; among the latter, indurated mucilage, cholesterine, a mixture of picromel and yellow matter, indurated bile, indurated stools, lithic acid, the lithates of ammonia and soda, the matters

called the cystic and xanthic oxides, indurated fat, and fibrine. Of these, a calculus of silica (Fourcroy and Vauquelin) has in general a hard rough surface, and a dark colour: it is not soluble in any acid except the fluoric, and with potassa may be fused into a kind of glass. It is found in the urinary organs, but is very rare. A calculus of the phosphate of ammonia and magnesia (Wollaston) has a tubercular surface, is semi-transparent, of a pure white colour, and soft crystalline structure, in appearance something like calcareous spar: it is soluble in acetic acid, from which it is again precipitated by ammonia, and is decomposed by a solution of potassa, the ammonia passing off in pungent fumes, and the magnesia being precipitated. It occurs in the urinary organs, and is generally perhaps a secondary formation. It is this kind of calculus that is liable to become of immense size (instances are on record where they have attained 24, 33, or even 44 ounces in weight). A calculus of the carbonate of lime (Crampton) is generally white and friable, and to be known principally by its effervescence with acids. It is found in the urinary organs, but is very rare. A calculus of the phosphate of lime, or a bone-earth calculus, is smooth, of a pale-brown colour and lamellar structure, soluble without effervescence, not in acetic, but in hydrochloric acid, from which it is again precipitated by ammonia: it is not decomposed by a solution of potass. It is very common in all organs, often constituting the reputed ossifications of the bronchia, heart, intestines, pancreatic duct, and urinary organs, particularly of children from four to eight years old, about the cessation of ossification, where it is generally secondary, but

sometimes primary: it is also found in the uterus and salivary ducts.

A calculus of a mixture of phosphate of ammonia and magnesia and phosphate of lime (or a fusible calculus) resembles chalk in its physical characters, and its tests are those of its two ingredients: it is distinguished principally by being easily melted before the blowpipe: it is found in the urinary organs. A calculus of the oxalate of lime, or a mulberry calculus, has in general a fungous appearance, a dark colour, and an irregular lamellar structure: it is decomposed by heat, the lime alone being left, but is not readily acted upon either by acids or pure alkalies, though decomposed by the carbonates of the latter. It occurs in the urinary organs, and is generally perhaps primary. Such, then, are the chief calculi composed of earthy matters. Of those consisting principally of animal matters, a calculus of indurated mucilage is in general lighter than water, viscid to the touch, semitransparent, and uniform in its structure: it is soluble in boiling water. Its seat is in the intestines. A calculus of cholesterine is always lighter than water, saponaceous to the touch, white and shining, of a lamellar structure, easily fusible and inflammable, and soluble in hot alcohol, from which it falls on cooling, as well as in ether and oil of turpentine. It is found in the gall-passages, and sometimes as many as from 1000 to 3000, of a size from that of a walnut to that of a hen's egg, have been passed in this way.

A calculus of a mixture of picromel and yellow matter, and one of inspissated bile, agree in general with the preceding, except that the former is of a dirty green or brown, and the latter of an almost black

colour, and the texture of both is generally uniform: it occurs also in the gall-passages. A calculus of indurated stools is well known under the name of scybala: it is of course confined to the intestines. A calculus of lithic acid is smooth, of a brown colour and lamellar structure: before the blowpipe it first gives off a fœtid odour, and afterwards burns: it is sparingly soluble in water, but readily in a solution of potassa, from which it is precipitated by sulphuric acid; and it becomes pink when acted on by the nitric acid. It is met with in the urinary organs, is always perhaps primary, and the most common of any.

A calculus of the lithate of ammonia is of a gray colour and lamellar structure, and soluble in water; when thrown into a solution of potassa, it gives off an odour of ammonia, and, unlike the preceding, it is soluble in the alkaline carbonates. It occurs in the urinary organs, but is very rare.

A calculus of the lithate of soda is soft and friable, sparingly soluble in boiling water; treated with any strong acid, it affords crystals of lithic acid: it constitutes the chalk-stones, nodosities, &c. occurring in bursæ mucosæ.

A calculus of the cystic oxide has a tubercular surface, and is of a yellowish colour and crystalline wavy structure, in appearance something like that of the phosphate of ammonia and magnesia: it emits a very fœtid odour when heated, is not soluble in water or the weaker acids, but combines with all the stronger acids and alkalies. It is found in the urinary organs, and is generally perhaps primary. A calculus of the xanthic oxide is of a smooth surface, a cinnamon colour, and lamellar structure: it emits a faint odour

when heated, and is soluble in boiling water and most acids and alkalies,—its solution in nitric acid affording by evaporation a substance of a brilliant citron colour: it occurs in the urinary organs. A calculus of indurated fat agrees in general properties with one of cholesterine, except that it is not lamellar: it is met with in the intestines. Lastly, a calculus of fibrine is of an uneven surface and brown colour, and is composed of rough fibres radiating as from a centre: it gives off a peculiar odour when heated, is insoluble in water and hydrochloric acid, but soluble in most other acids and alkalies: it is found in various organs, and is allied to those depositions which have been so often mistaken for polypi, worms, &c.

With respect to the formation of calculi, we have every evidence which analogy, with increased secretion in general, can afford (whether the product be organized or unorganized), that they are the result of inflammation; and in the instance of those calculi which are found in the bursæ mucosæ in gout, we have a direct proof that this is at least sometimes the case. The instances also of calculi in the bronchi, so frequent with those whose avocation obliges them to inspire air loaded with dust of various kinds, round the particles of which such calculi are frequently deposited, as well as those in which they have formed round large bodies, as a cherry-stone accidentally received into the bronchi, strongly corroborate this opinion. The same may be said also of calculi in the urinary bladder, so often produced by stricture or hypertrophy of the prostate gland, which are found collected round a nucleus formed by a calculus received from the kidneys, or round a pin, a piece of

bone, straw, or linen, a broken bougie, or leaden bullet, and so forth, all sufficiently obvious causes of irritation; all which are strongly in favour of this opinion, and justify us in concluding that inflammation is the chief, if not the only, cause of this morbid change.

In the alternating calculi also a layer of blood not unfrequently displays itself, and calculi often co-exist with masses of coagulable lymph. The same may be said also of some kinds of intestinal concretions, which are often collected round masses of undigested aliment, as the beard of the oat (hence common in Scotland), and the fibrous part of the stock of cabbage, &c.; and it has been already mentioned how liable prisoners are to biliary calculi, and consequent jaundice, obviously from the slow inflammation of the liver—originating in the diminished action of the lungs.

The doctrine that inflammation is, *at least sometimes*, the cause of every common description of concretions, gouty, bronchial, urinary, intestinal, biliary, and uterine, is unquestionably true; and we seem to have no right to assign, without much better evidence than we at present possess, any other cause than this for their production at any time. But why, it may be asked, should inflammation, occurring in the same organ (*e. g.* the kidney or urinary bladder), give rise, at different times, to concretions of so very different a nature? To this it may be answered that we know not; but it will be time to urge this as an objection to the doctrine above adopted, when we can tell why inflammation occurring in the same organ (*e. g.* the mamma or the testicle) should give rise at one time to a deposition of tubercle, at ano-

ther of encephaloid tumours, and at a third of scirrhus; and there are few who doubt that such is always the origin of these depositions. It has indeed been very generally supposed that these peculiarities are dependent upon some vitiation of the blood, nay, that the inflammation itself, or whatever other cause gave rise to calculi, originated in an alkaline condition of the blood, for example, in those cases where there was a deposition of the phosphates; in an acid condition of this fluid, when calculi of the lithic acid and the lithates were produced; but it may be here repeated, what has been so often before said, that there is no proof or probability of primary change in the blood, either constituting any part of the exciting cause of inflammation, or at all modifying its result, in this or in any other instance. So lately as 1671, Dr Shirley attempted to explain the production of calculi in the animal body upon the same principle as that of stones in the mineral kingdom; and to this day it is a prevalent notion, not only with the vulgar, but even with medical men, that the materials of such calculi are conveyed into the body with the water,—a vague absurdity, which has been already alluded to when on the subject of parasitical animals, and which a true knowledge of the usual principles of such calculi ought long ago to have exploded. Not only are the waters of calcareous districts (such as Norfolk) as pure, or much purer, than those of other districts where calculi are almost unknown, but, with the exception of carbonate of lime and silica (both of which are extremely rarely found in calculi), there is scarcely an ingredient in these substances commonly met with in

the mineral kingdom; but though these ingredients entered the stomach at every meal, it would afford no support to a doctrine so directly opposed to every thing that we know of the nature of secretion, as well as to the fact that each organ of the body is the seat of calculi more or less proper to itself, which could not be the case if the ready-made ingredients were continually traversing the whole body with the blood. But we must not confound with proper calculi, as the products of secretion, foreign substances in any way received into the body by accident or design, as magnesia in the duodenum, &c.

The calculi found in the inferior classes of animals consist for the most part of nearly the same ingredients as those of man, except that those of the lithic acid and lithate of ammonia, the former of which is the most common of all in man, are in the lower animals very rarely met with. The calculus of indurated yellow bile of the ox is in great request as a beautiful yellow pigment; and those of the phosphate of ammonia and magnesia, combined with various animal matters of the goat, the chamois, camel, elephant, and other herbivorous quadrupeds, are the substances known by the name of bezoars, formerly held in such ridiculous esteem as alexipharmics.*

We come now to speak of the increase of fluid

* They came into request first at the time of the Arabian physicians, when they were frequently sold for ten times their weight in gold; and it is not long ago since three such calculi were sent to Bonaparte by the emperor of Persia, as an invaluable present. Ambergris also appears to be nothing but a kind of fatty concretion, formed sometimes in the intestines of the white whale.

matters as the result of inflammation, and we shall follow here the same order as when speaking of the solids; mentioning, first, a few of the natural fluids which are liable not only to be laid down in excess, but to be vitiated in their quality; and afterwards a few preternatural fluids which are liable to be formed exclusively from this cause. In speaking of the natural fluids, the quantity and quality of which are liable to be affected by inflammation (exclusive of the halitus and blood, both of which will be considered separately), we shall follow the arrangement of these formerly adopted from Chaussier, into perspirable, follicular, and glandular, speaking, among the first, principally of the *fat;* among the second, of the *mucilage*, *stools*, and *sebaceous fluids;* and among the third, of the *bile* and *pancreatic fluid*, the *urine*, and the *saliva;* as chiefly liable to be augmented and vitiated from this cause, exclusive of those instances in which, as has just been said, some of them form various kinds of calculi.

It is not certain that the quality of the fat is very materially changed by inflammation; but its quantity, either in particular organs or in the whole body, is sometimes prodigiously increased by it. Thus the fat about the heart is sometimes so enormously increased (generally from without inwards) as to occasion the absorption to a greater or less degree of its muscular substance, and thus an apparent conversion of this organ into fat; and the same thing occurs sometimes as well in the larger vessels as in the external muscles. With respect to the other solid organs, it is probable that bronchocele is frequently something of the same nature, although often, appa-

rently, more altered;* and the ovary, likewise particularly liable to dropsy, has been not unfrequently noticed to undergo a fatty degeneration. In bronchocele, the vesicles of the adipose or cellular tissue sometimes attain the size of a pea, and the whole tumour frequently extends laterally far beyond the angles of the jaw, to beyond the chin, and longitudinally to the middle of the chest. Why it should affect principally the inhabitants of the valleys of the Alps, and in this country those of Derbyshire, can no more be explained than why urinary calculi should be more prevalent in Norfolk than elsewhere; but of course it has been attributed to the water, the same being either the product of melted snow (Pliny and Scaliger), or loaded with foreign particles. It is often combined with scrophula and rachitis, and depends obviously on inflammation. It will perhaps be less readily admitted that this is the case with respect to polysarcia, although we have no hesitation in believing that it is so. The degree to which this disease sometimes proceeds is enormous.†

* [Bronchocele consists in either a partial or general hypertrophy of the cells of which the thyroid gland is composed. These cells become filled with a gummy substance (colloide). Sometimes the hypertrophy of the cells exceeds the exudation, and they become developed into fibro-serous cysts; at other times there is a copious secretion of gelatinous or albuminous fluid, which may fill up the interstices of an extremely delicate newly-formed net or cell work. It can scarcely be doubted that the process has its origin in irritation, the more so since repeated inflammation very frequently occurs in the walls of the dilated cells, and especially in the above-mentioned cysts. (Rokitansky, op. cit. bd. iii. p. 151).]—EDITORS.

† Among the most remarkable instances on record are Bright of Malden, who weighed 728 lbs., and Lambert of Leicester, 739 lbs.

Of increased follicular depositions, we have examples of mucilage in dysentery, gonorrhœa, leucorrhœa, and catarrh, as well as towards the close of bronchitis and peripneumonia; and in most of these cases the mucilage is not only increased in quantity, but often very much vitiated in quality. Thus, in dysentery, as well as after peripneumonia, it is often streaked and mixed with blood, giving it a greenish colour; and in the latter case it is commonly so much more viscid than ordinary, that it does not flow at all, though the vessel in which it is contained be inverted. In gonorrhœa it has more or less the appearance of pus, and generally a very fœtid odour; but its most characteristic property is that of virulence, or the capability of exciting an inflammation similar to that by which itself was generated. This property not having been noticed by the ancients, it is commonly believed that they were happily ignorant of the disease. But how easily might this circumstance have been unnoticed, when, from the more promiscuous intercourse of the sexes, a man's going astray was often quite forgotten before the effects of it appeared, and when comparatively very little attention was given to contagion as an exciting cause of disease. Nobody doubts that the ancients were acquainted with porrigo and scabies, but they very generally overlooked their origin from contagion.

In leucorrhœa the discharge is less offensive, and not virulent, but is capable of producing ophthalmia

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Haller gives the case of a man who weighed 800 lbs., while the common weight of the body is 150 lbs. of which 7 is fat, so that in the last case the prime fat was about 657 lbs.

purulenta of infants. (Gibson, Ware, Lyall, Morrison.) In catarrh, the voided mucilage is not only increased, but deteriorated, being commonly, instead of colourless, transparent and insipid, of a light-green or yellow colour, more or less opaque, and of a saline taste, appearing to contain considerably more albumen and salts than natural (Pearson); and the same appears to be the case also after bronchitis.

But besides these changes in the quality of mucilage, as affected by inflammation, it is sometimes so much altered as to be with difficulty recognised. Such is the case with respect to that of the mouth in the later stages of typhus fever, when it constitutes the black sordes, by which the tongue and teeth are coated; and it is extremely probable that the black matter vomited in yellow fever, like pitch, or coffee-grounds, is nothing but the corrupted mucilage of the intestinal canal (Fordyce, opposed to Cockerel, who considered it to be bile, and to Bancroft and others, who supposed it to be blood). The changes undergone by the stools in inflammation are familiar to every body, and seem to depend upon some difference in the proportion of their natural ingredients. This is the case in diarrhœa, under which name the nosologists have ingeniously included, not only too copious and liquid stools (the only precise meaning), but discharges of unchanged aliment, chyle, mucilage, bile, blood, pus, and who knows what besides, which are all distinct diseases.

It is to a similar increase in quantity, and change in quality, of the sebaceous fluid by which the lacunæ of the skin are obstructed, that was attributed .the origin of acne molluscum, and the various sebaceous

tumours frequently found on the surface of the body, called steatoma, atheroma, meliceris, &c. according to the consistence of their contents.

So much then for the follicular secretions. Of the glandular,—the bile, instead of being opaque, viscid, and of a yellowish-brown colour, is sometimes, as in cholera, semitransparent, thin, and of a dirty straw colour; changes which are attributed by Orfila chiefly to a vitiation of its resin.* It is likewise sometimes excessively acrid.

But of all the fluids in the body, there is none which undergoes such remarkable vitiation as the urine, implying that, in a very great number of dis-

* So much indeed has the bile been altered in this disease, that it has even been questioned whether it be bile at all, and not rather a vitiated secretion from the intestines. Nor does the etymology of cholera at all justify us in believing that the discharge was originally considered to be bile, since the word χολη, translated *bilis*, signified not bile (which was called *fel*) alone, but any corrupted discharge from the intestines; and, according to Trellius, the word cholera is derived, not from χολη, but from χολαδες, the old denomination of the intestines. Glisson also says that the matter voided is not "ejusdem natura cum bile." Sydenham makes no mention of a discharge of bile in his epidemic cholera of 1669; and Cullen says it consists in a discharge of fluid only, "plerumque biliosa." In modern times, also, it has been generally noticed that an evacuation of pure bile is one of the best symptoms in cholera, and generally indicates recovery. But what does this shew, except that the disease is diminished, so that what was previously vitiated is now natural. We may as well question that the mucilage in catarrh or gonorrhœa is mucilage, or the urine in diabetes is urine, as that the bile in cholera is bile, since it is not a whit more changed than these; and there seems to be a regular gradation in the changes which it undergoes, in proportion to the severity of the disease, from the common autumnal cholera of this country, to the most violent degree of the Indian epidemics.

eases, the kidneys are sympathetically affected. Thus, while it is at one time remarkably deficient in one or other of its characteristic principles, such as urea and lithic acid, or even of all of them, consisting entirely of water, as in the first stage of fevers, in the severer cases of nephritis, and at the close of a paroxysm of asthma or hysteria; in others it abounds with one or other of these principles, as albumen in dropsies, or phosphate of lime in rickets; and in others contains principles naturally foreign to it, as the purpurate of ammonia in the second stage of fevers, in moderately severe nephritis, and in gout; or the subcarbonate of ammonia in the last stage of fevers, in scorbutus, and other diseases reputedly putrid. But it is in diabetes that the quality of the urine is chiefly remarkable (abounding as it does in sugar), as well as its quantity, which is sometimes immensely increased, while the natural principles are not diminished, but in inordinate abundance. (Bostock, Hay, Chevreul.)

It cannot but strike one as exceedingly remarkable, that not one of the hypotheses which have been proposed to explain this disease (except spasm, which was at one time applied to every thing) should have been applied to the explanation of catarrh, dysentery, diarrhœa, gonorrhœa, cholera, pyrosis, ptyalism, and a number of strictly analogous diseases, since the secretions in all are not only remarkably abundant, but often very remarkably changed; and that so much ingenuity should have been lavished on diabetes, and so many physicians in every age should, like Dr Latham, have employed themselves, as he says, in weaving hypotheses to explain the phenomena of this

disease, as of something altogether isolated and recondite. Bonnet and Ruysch, a century and a half ago, noticed that the kidneys, after death from this disease, always displayed marks of previous inflammation. The same fact has been reiterated down to the time of Cruickshanks and Baillie. Dr Watt, in referring diabetes to a loss of balance between the mass of blood in the kidneys and the power by which it is moved, admits all that we know of inflammation as the cause of the disease; and Dr Prout has noticed the facility with which the abundance of sugar in diabetic urine is frequently converted, by a small quantity of opium, into an abundance of urea, proving that the affection whence they both proceed is very nearly allied, although he represents the sudden conversion of a principle without azote into one abounding in it as one of the most curious facts in all physiology! It is curious only to chemists.

The yellow colour of the urine in jaundice has no connexion with inflammation of the kidneys, and perhaps some of the changes above noticed, such as those it undergoes in dropsy and rickets, are not strictly referrible to this head; the increased quantity of albumen in the former case, and the phosphate of lime in the latter, appearing to arise from the greater absorption of the solid parts, soft or hard, into the blood, to be again eliminated at the kidneys, almost in the manner of the absorbed bile in jaundice. The presence of subcarbonate of ammonia also in this fluid, in those diseases commonly called putrid, seems to arise, not from any inflammation of the kidneys, but from a partial putrefaction of this fluid in the urinary bladder.

The last fluid to be noticed as particularly liable to

be augmented and vitiated by inflammation is the saliva, the quantity of which in ptyalism is sometimes enormous; and it sometimes appears to acquire a virulent property, as in hydrophobia. It is questioned, however, by Trollier and some others, whether the contagion in this instance do not reside rather in the mucilage than in the saliva.

This subject must not be dismissed without recurring to what was mentioned when on the subject of glandular secretion in general, that the proper secretion of any gland takes place at the *radicles* alone of the ducts, of which such a gland is essentially composed; consequently that it is only when such radicles are the seat of inflammation that such proper secretion is increased. Hence it is easy to explain the apparent anomaly, that in a proper hepatitis we have not cholera; in a proper inflammation of the pancreas, no pyrosis; in a proper nephritis, no diabetes; and in cynanche parotidea, no ptyalism;—so far from it, there is a suppression, to a greater or less degree, of the proper secretion of the gland. But this supports the doctrine, that secretion is always increased by inflammation, for the seat is now the mucous membrane of the ducts; and the increased secretion and swelling in them produces obstruction to the proper secretion of the gland, and thus gives rise to its suppression.*

* It was probably from the changes which the fluids of the body undergo from disease being more manifest than those of the solids that the humoral pathology of the ancient physicians took its rise. Obscure as are the affections of the latter, it could not escape them that in many diseases both the quality and quantity of the natural secretions from the body, such as the stools and urine, were materially altered, and that, besides these, unusual discharges, as of mucilage, bile, and saliva, frequently took place; and it was natural to lay

hold of the latter as the primary and essential affections, and to consider the former when they occurred as merely secondary and adventitious. Thus it was obvious that in catarrh there was a preternatural flow of mucilage from the nostrils; and as it had been settled that this mucilage or phlegm came in all cases from the ventricles of the brain, it was easy to imagine, that what in one case reached the nostrils, might in another extend to the mouth, lungs, integuments, joints, and other parts, and thus occasion ptyalism, bronchitis, or tubercles in the lungs, anasarca, rheumatism, or gout, and so forth. The same remarks are applicable to the numerous diseases attributed by them to a flow of bile and other fluids.

They saw a little and imagined much, and everywhere so interwove observation and truth with system and absurdity, that it has been the work of ages to separate them, if indeed the separation may even yet be considered as completely effected. But as in the production of diseases the ancients attributed every thing to an influx of one or other of the four different fluids of the body, so in the progress of them there was no fluid to which they paid so much attention as the urine, from the condition of which principally they formed their opinion as to the progress of the wished-for concoction of the crude morbific matters already mentioned. Hippocrates is sufficiently full upon this subject, but he is, as usual, quite outdone by Galen. Theophilus, however, complains that they are neither of them half minute enough; and Actuarius makes the same complaint of Theophilus. The last, certainly, who lived in the thirteenth century, treats his subject, as in his preface he prays to heaven he may do, "pro artis dignitate," and, among other things, gives a very edifying diagram of a glass chamber-pot, graduated from the top to the bottom, in order to display the several ingredients of the urine in their relative situations, so that a proper name, as cremor, nubecula, enæorema, hypostasis, &c. might be assigned to each. These machines were for a long time in great request; they were again delineated by good Dr Recondi, as he was called, in his "Urinall of Physyke," published 1547; and are alluded to by Shakspere, who says of some person's follies, that they shine through him like the water in an urinal. But the height of absurdity was not reached until Rhenanus divided the urine, like the body, into head, hands, feet, &c. and till simple uroscopy passed into uromancy, or the art (still professed by some) of divining all diseases by the mere inspection of this fluid.

CHAP. XIV.

INCREASED DEPOSITIONS OF HALITUS AND BLOOD.

DROPSIES—BLEBS AND VESICLES—RACHITIS—PATHOLOGY OF DROPSIES—HÆMORRHAGE—BLOOD SECRETED, NOT EFFUSED.

With respect to the deposition of halitus as the result of inflammation, the increased secretion of this fluid constitutes not only, as deposited in the cellular tissue or serous sacs, the various species of dropsy, but also, as deposited either above or in the substance of the mucous or dermoid tissue, blebs and vesicles. The colour and consistence of the deposited fluid vary very much in different instances, being sometimes quite transparent, at others more or less opaque, sometimes colourless, at others of a white, yellow, green, red, brown, or even black tint, and sometimes (as is generally the case in hydrocephalus) as liquid as water, at others (as frequently happens in ovarian dropsy) as thick and tenacious as painters' size. It is usually coagulable by heat, but this is not in general the case with the water of hydrocephalus: not unfrequently also it is mixed with shreds of coagulated lymph, or other foreign ingredients.

Such an increased and often vitiated deposition of halitus, when situated in the cellular tissue, constitutes œdema of the glottis and of the lungs, dropsy of the

ovaries, hydrophthalmia, anasarca, and perhaps also rachitis and mollities ossium; situated in the serous sacs, hydrothorax, dropsy of the pericardium, ascites, hydrocele, hydrorachitis, and hydrocephalus; situated on the surface of the dermoid tissue, erysipelas and pompholyx; situated within the substance of the mucous membrane of the mouth, aphthæ; within that of the dermoid tissue, vaccinia, varicella, herpes, and rupia. The propriety of placing blebs and vesicles by the side of dropsies may, in a practical point of view, perhaps be questioned; but it is undoubtedly their proper place in as far alone as pathology is concerned,—they are preceded by inflammation (as we shall immediately endeavour to prove is the case with all the rest), and go on like all the rest to a preternatural deposition of a serous fluid. It has been too long the practice to regard diseases of the skin as something *sui generis;* and there is another organ, also, the diseases of which it has been equally the practice to regard as something isolated and inexplicable upon common principles, that is, the bones; and many will be staggered when they find rachitis also placed among the dropsies. Some of those, however, who have paid, not only to pathology in general, but to the bones in particular, the greatest attention, are decidedly of opinion that the essence of the disease consists in a preternatural deposition of a serous fluid, more or less thick, as in bronchocele, ovarian dropsy, &c. &c. in the cellular tissue of the bones. The most obvious character of this disease is a deficiency of earthy matters of the bones (which, instead of half their weight of this ingredient, have been found by Bostock to contain not more than $\frac{1}{8}$th to $\frac{1}{5}$th), and a consequent preternatural flexibility; and so long as the

nature of the earthy matter was unknown, pathologists were in general satisfied with the observation, that in this disease either the absorbing vessels took up too much, or the secreting vessels laid down too little, of this matter. Since the discovery of 1771, that this earthy matter was chiefly phosphate of lime, many theories have been proposed on the subject, all of them more or less chemical. As these, however, have been noticed in a previous part of this work, we need not revert to them in this place.

With respect to the pathology of dropsies, the impropriety of speaking of them as mere *effusions* will be sufficiently evident, when we consider not only what has been already said of serum not being a preexisting ingredient of the blood, but also how widely these fluids frequently differ from mere serum. Not only do they almost always contain an unusual quantity of albumen, sometimes so much as to render them almost concrete, but they are so far from being always colourless and transparent, that they are often variously coloured and of various degrees of opacity. They sometimes, moreover, as has been remarked, acquire the power of exciting a kind of inflammation similar to that by which they were themselves produced, as in vaccinia. In this case, as well as in that of all the other vesicles and blebs, the fluid is manifestly the result of inflammation; and that it is this state alone which produces not only every kind of vesicle and bleb, but every dropsy, is probable, as well from analogy with increased secretions in general (and the natural halitus of the body is as much a secretion as mucilage or bile), as from those numerous cases in which every symptom of inflammation has preceded

the morbid change in question; and although those symptoms are sometimes so obscure as to attract little or no attention, yet this circumstance can form no fair objection to an opinion which has otherwise so much in its favour. The notion that dropsy arises from a mere effusion of the serum of the blood, produced by other causes, seems at first sight to be supported by the facts that it frequently occurs in persons debilitated by long diseases, and particularly by frequent losses of blood, and that it is often manifestly the result of pressure on the veins, as by a tumour of the liver, pancreas, spleen, &c., or by obstruction of the course of the blood through the right cavities of the heart. But all increased secretions from inflammation are the result, not of increased, but of diminished action of the vessels, which may be easily supposed to take place rather in debilitated than in other habits; and with respect to pressure on the veins or obstructions of the heart as causes of dropsy, these may with much greater reason be supposed to produce some degree of inflammation in the capillary arteries connected with the radicles of the veins, and a consequent increased secretion from them, than a merely mechanical straining from them of a portion of their contents; and that this is really the case is probable from the circumstance, that a similar impediment to the flow of venous blood, such as that produced by a varix of the veins of the leg, is one of the most common causes, first of œdema, and next of ulceration about the ancles, the latter of which unquestionably arises from inflammation. The reason that the secretion of halitus is more frequently increased from these causes than any other secretion, may be easily found in the

more extensive distribution and greater simplicity of the apparatus concerned in affecting all the perspirable secretions, and particularly the halitus, than in that concerned in effecting either the follicular or the glandular.

A tendency to the termination of an inflammation in dropsy is frequently equally remarkable as that to the deposition of scirrhus or tubercles, and constitutes what is called the dropsical diathesis, which, as before remarked, is observable principally in persons of the phlegmatic temperament.

Besides increased deposition of fluid, however produced, another cause frequently assigned as giving rise to dropsy is diminished absorption; but the supposition that dropsy is ever either wholly or in part caused by this, is, as remarked by Dr Parry, quite gratuitous. When on the subject of absorption, it was mentioned that we had few but presumptive proofs that absorption is ever more rapid at one time than another, and that most, if not all, the commonly alleged instances of diminished or increased absorption might be equally well, if not better, explained upon the principle of diminished or increased deposition. It is no doubt extremely probable *a priori*, that the molecular attraction constituting absorption is capable of being increased or diminished, as well as the molecular repulsion constituting secretion; but while we have the most satisfactory examples of increased and diminished secretion, we have no very conclusive evidence that absorption is ever increased, and still less that it is ever diminished; and even though we had, the admission in this case of such diminished absorption would be against the well-

known law of philosophy, which forbids us to assign two causes for any effect, when one is adequate to produce it. It appears, besides, extremely inconsistent, continually to mention as a cause of a preternatural accumulation of halitus, one which is never mentioned as a cause of a preternatural accumulation of mucus, fat, bile, saliva, or any other secretion of the body; as well as extremely gratuitous to suppose that this halitus is alone deficiently absorbed, while the absorption of every other fluid and solid part goes on (as it certainly does) as before. If this were not the case, how could we explain the great emaciation which is so frequently attendant on dropsies, to say nothing of the effect of remedies rubbed in upon the surface, which are so frequently had recourse to in their treatment, but to the action of which, we have elsewhere said, this absorption is perhaps unnecessary. The former circumstance, at least, implies that absorption is unimpaired, and, in conjunction with the other arguments already adduced, seems quite sufficient to justify us in concluding that diminished absorption is never instrumental in the production of dropsy.*

* The quantity reported to have been deposited is sometimes enormous. It is said, but it is quite incredible, that 150 pints of liquid have been discharged from the chest at one opening, and no less than 7000 pints are reported to have been so voided at several openings by the same individual. In a recent case, also, related by Dr Weatherhead (Lond. Med. Trans. 1828), the belly was tapped 47 times, and the man lost altogether 566 pints of fluid. This operation, however, has been performed on the same individual no fewer than 150 times (Phil. Trans. 1775), and upwards of 1000 pints of fluid have been voided (Scott, Med. Com. 1778). In one case related by Storck, 100 pints of liquid were evacuated at one opening, equal in weight to about two thirds of the whole body. Even from the tunica vaginalis testis, up-

As an extravasation of halitus constitutes the various kinds of blebs, vesicles, and dropsies, so an extravasation of blood constitutes the various kinds of hæmorrhages. It is not always however pure

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wards of 60 pints of liquid have, it is said, been discharged at one operation. But all these accounts fall short of those of water in the ovaries, one case of which was said by Mey to be equal to 212 lbs. in weight; and as much as 6631 pints are described by Martineau (Phil. Trans. 1784) as having been drawn off by repeated operations from the same patient, in this disease. Even in the skull no less than twenty-five pints of water are described by Bonnet as having been in one instance collected.

The oldest notion of dropsy was that it arose from an accumulation of phlegm flowing from the brain into the part affected, and constituting a species of inflammation called leucophlegmatic or œdematous. The ancient physicians indeed knew as well as we do, that frequently

" Corrupto jecoris vitio, vel splenis acerbo
Crescit hydrops;"

but this was imagined to arise from a preternaturally cold temperature of these organs, so that either an imperfect sanguification took place in the former, or an imperfect purification of the blood in the latter, whence, instead of pure blood, was formed phlegm, of either of which they conceived that a humour indiscriminately called dropsical might consist. Of the early successors of Galen, Trallier was almost the only one who questioned whether dropsies always arose from a "causa frigida," or phlegm; and in this he was followed, after the revival of literature, by those who attributed dropsy, at least sometimes, to a *causa calida*, or blood; and a violent contest thence arose between the patrons of the causa frigida and causa calida, which was not settled till the year 1717, when the Florentine physicians established it that there were two kinds of dropsies, the one cold and the other hot. This "*causa calida*," or influx of blood as a cause of dropsy, if it meant any thing, could mean only inflammation in the modern acceptation of the word, since the first broachers of it knew nothing of accumulation of blood from any other cause. After the discovery of the circulation of the blood, however, and Lower's celebrated experiment of producing dropsies by tying the larger veins (sufficiently accounting for the effect of tumours of the liver and spleen in producing it), this explanation of dropsy was in general lost sight of.

blood which displays itself in hæmorrhages, any more than pure serum in dropsies; the said blood being of a lighter or darker colour, and more or less fluid, than ordinary, as well as not unfrequently mixed with patches of coagulated lymph, or other extraneous matters. Such depositions of blood may take place, like dropsies, either into the cellular tissue of the body, into certain serous sacs, or on the surface of the dermoid tissue, and, unlike dropsies, are frequently voided by the natural outlets of the body, constituting the proper hæmorrhages. Hæmorrhages, like dropsies, are commonly spoken of as the result of effusion, but, unlike dropsies, are frequently described as of two kinds, being called *active* when produced, as is supposed, by an over-action of the vessels from which they flow, and *passive* when produced, as is supposed, from their preternatural relaxation. In the former case it is generally alleged that the vessels engaged are arteries alone, whereas in the latter they may be either arteries or veins. But, confining ourselves to the arteries, how very inadequate any of these causes is to explain hæmorrhage, must be abundantly obvious, since (admitting for a moment a mere mechanical view of the subject) the over-action of the capillary arteries could have the effect only of forcing the blood in greater quantity into the corresponding veins, and not through their own parietes; and the relaxation of the parietes of both arteries and veins often takes place to the greatest degree compatible with the continued life of the vessels, without producing any discharge of blood. Not only, then, does the distinction so long established between active and passive hæmorrhages (putting out of the question

those effusions of blood which are the consequence of a direct wound or ulceration of the blood-vessels) appear to be entirely unfounded, but neither of the conditions of the vessels above assumed is capable of accounting for the morbid change in question; and to the antiquated notion of a vitiated state of the blood itself generally brought in to explain scorbutus, purpura, &c. we need not here revert. On the contrary, the opinion that hæmorrhage is always not an effusion, but a secretion, always from the arteries, and always the result of inflammation, is supported as well by the frequently changed character of the extravasated blood, as by the impossibility in general of finding any aperture in the vessels whence the discharge proceeded;* by the frequent tardiness of its appearance (as in the case of a black eye from a blow); by analogy with increased secretions in general, particularly the menstrual discharge (which, when increased, often becomes pure blood, and constitutes true hæmorrhage); and, lastly, by the general symptoms which so often precede the discharge. Now if hæmorrhage had been a mere effusion of blood, it is evident that the character of the blood ought always to have been unchanged; that the pores of the vessels through which it had escaped ought to be at least sometimes visible; that it ought to have taken place instantly upon the application of the exciting cause; that other secretions ought never to have degenerated into this; and that inflammatory symptoms ought never to have preceded it.

* Proved by Elliotson, &c. with respect to hæmorrhois; by Wepfer, Morgagni, Portal, Cheyne, Rochoux, and Abercrombie, with respect to apoplexy, &c. &c.

It was indeed the presence of inflammatory symptoms in some cases, and their absence in others, together with all the marks of general debility in others, which first gave rise to the imaginary distinction of hæmorrhages into active and passive. But, with respect to the former, it has been sufficiently shewn, that those states of the body in which the symptoms indicate the highest excitement, are in fact, with respect to the affected vessels, states of diminished action; while with respect to the latter, although diminished action must be admitted, still it is not of the character which it has been generally supposed, not opposed to inflammation, but identical with it. The circumstance that hæmorrhages as well as dropsies sometimes arise from an impediment to the course of the venous blood, produced by pressure upon the veins, obstruction of the blood through the right side of the heart, &c. may be easily explained upon the same principles as the production of dropsies from similar causes. Nor will the *occasional* suddenness of the discharge, or quantity of the blood voided, be urged as any objection to the doctrine, that hæmorrhages are always the product of secretion, by those who con sider that a gush of tears is frequently *in an instant* secreted by so inconsiderable an organ as the lacrymal gland. Here we have almost instantaneous inflammation, followed by a copious secretion; and hence the almost *instantaneous* occurrence of a hæmorrhage from a blow, any violent exertion of body, or emotion of mind, can furnish no fair argument against the doctrine of their arising from inflammation, any more than the *quantity* of blood discharged does against the doctrine that this blood is secreted. Nay, this circum-

stance appears to be one of the strongest arguments in favour of the view which we are at present advocating, since it is inconceivable that the mere mechanical giving way of a few inconsiderable vessels (and they must be very inconsiderable when their apertures are not afterwards to be found) should give rise to such sudden and copious discharges of blood as frequently take place from the lungs, stomach, and other organs, whereas it is easily understood how such discharges should result from the increased secretion of the numerous capillary arteries distributed over the broad area which these organs present. The tendency to the termination of inflammation by hæmorrhages is frequently not less remarkable than that to the deposition of tubercular or scirrhous matter, or to dropsy, and may with propriety be said to constitute a hæmorrhagic diathesis; and it is worthy of notice, that the inflammation which goes on to hæmorrhage is more apt than any other to become periodical, in this respect resembling that periodical irritation which gives rise to the menstrual discharge, and establishing thus another point of analogy between a hæmorrhage and an acknowledged secretion.

The earlier pathologists, for the most part, ignorant that the arteries contained blood, and quite ignorant of the general circulation of this fluid, had of course but very inadequate notions of the nature of hæmorrhages. They affected to speak of them indeed as resulting either from a power resident within the blood itself, by which it overcame the resistance of its vessels, or from a breach of continuity in these vessels, effected either by a preternatural dilatation of their supposed pores, or by putrefaction. With respect to

almost all the general doctrines of the pathology of hæmorrhage, they have hinged for the most part upon principles purely mechanical.*

* The notion of a gap in the blood-vessels, however produced, has been till lately almost inseparable from the idea of a hæmorrhage, and the only difference generally admitted has been that this gap was occasioned sometimes by the inordinate impulse of the contained parts, and at others by an inordinate weakness of the containing; the supposed hæmorrhages from veins being supposed always to be of that description. It was however at length shewn, perhaps for the first time, by Wepfer and Morgagni, that in many cases of hæmorrhage there is no visible source of the blood; and in this they were supported by Bichat and Baillie, as they have more recently been by Elliotson, Larroque, Cheyne, Rochoux, Abercrombie, and many others, with respect to the most copious hæmorrhages from the lungs, stomach, rectum, brain, and other organs. In the mean time, Broussais succeeded in demonstrating that the distinction of hæmorrhages into active and passive (a distinction previously protested against by Rush and Parry) was altogether imaginary, as well as the idea that such hæmorrhages ever proceeded from the veins; and it has accordingly been pretty well established among all well-informed pathologists, that a discharge of blood can be considered no more as an effusion than a discharge of any other fluid of the body,—that all hæmorrhages, like all dropsies, are the result of secretion arising from inflammation; and though such discharges may be attended at one time with symptoms of preternatural *general* excitement, and at others with those of a totally opposite state, the local affection is always essentially the same. It is quite time, therefore, that the worse than unmeaning expression of breaking a blood-vessel, bursting a blood-vessel, &c. should be discontinued.

CHAP. XV.

PRETERNATURAL FLUIDS.

AIR—PUS—CHARACTERS OF PUS—DIFFERENCE BETWEEN PUS AND MUCUS—[ANALYSIS OF PUS—PYINA]—DIFFERENT KINDS OF PUS—GRANULATIONS—ORIGIN OF PUS—GANGRENE.

Such, then, are the principal natural fluids of the body deposited in either preternatural quantity or of a preternatural quality, whether in natural situations or the reverse, as the result of inflammation. We have now to speak of the deposition of preternatural fluids from the same cause, the chief of which are air and pus.

The air deposited as a consequence of inflammation (for that arising from a wound or ulcer of the lungs, or putrefaction of fluids, &c. does not belong to this place) is commonly, like that found in the air-bladder of fishes, a mixture of oxygen and nitrogen, the former being generally in very small quantity, particularly when the affection is of some standing, the oxygen being absorbed more speedily than the nitrogen, conformably to the general law, that, within certain limits, the more stimulating the substance the more rapidly it is absorbed: it generally contains also a little carbonic acid. Such collections of air are commonly either in the cellular tissue, the sacs of serous membranes, or on the surface of mucous mem-

branes. Tumours containing air, as well as those containing water, were classed by the earlier pathologists under the general name of dropsy; and, long after the revival of literature, the dry dropsy was spoken of almost as commonly as the wet. More recently, however, pathologists began to attribute such tumours, when not the result of a wound of the lungs, to fermentation somewhere or other, or to the entrance somehow or other of the atmospheric air; and when neither of these causes could be assigned, they boldly denied, like Willis and Littre, that the disease was possible. Thus Dr Cullen, in delivering the pathology of tympanitis, had no difficulty whatever in explaining the origin of a collection of air in the intestinal canal, which he attributed, of course, to the fermentation of the contained matters—the result of dyspepsia; but he could not understand how such air could get into the peritoneum, unless through a hole in some part of this canal, albeit such hole was never manifest. A better pathology was opened in 1716 by John Hunter, who, as we have before remarked, was the first to demonstrate that the blood-vessels have the power of secreting air, a fact, indeed, sufficiently obvious, from the constant evolution, by the process of secretion, of the halitus from the skin and lungs, to say nothing of that of carbonic acid from the lungs, and of the ordinary intestinal gases, both of which, we have endeavoured to prove, are true and legitimate secretions. Nay, it is not improbable, as has elsewhere been already shewn, that all the liquid and solid secretions of the body exist first in an aeriform state. It was first presumed by Dr Baillie, that a deposition of air was one of the

ordinary terminations of inflammation; and although it was at first imagined that this was nothing more than the carbonic acid naturally contained in the blood, the analysis of such air made by Dr John Davy, Dr Duncan, and others, would have more completely disproved this opinion, even although it had rested on much less uncertain foundation.

The last termination of inflammation by secretion which remains to be spoken of, is suppuration, or the deposition of pus.*

Pus resulting from the common phlegmonous inflammation is a clear-coloured opaque fluid, of a mawkish taste, and, when long exposed to air, of fœtid odour; composed of globules larger† than those in the centre of the red particles of the blood, and swimming

* [Suppuration seems to be confined to man and mammals: it was proved by Gueterbock (de Pure et Granulatione. Berolini, 1837), that it could not be excited in birds. He made wounds in the breasts of pigeons, and put in peas, masses of red precipitate of mercury, and other irritating substances; but in no case was suppuration produced. Hertwig also failed, even by the application of the actual cautery, to produce suppuration in birds (op. cit. p. 28).]—Editors.

† [The pus globules, according to Gluge (Anatomisch-microscropische Untersuchungen, &c.), consist of a whitish-gray mass, not very resistent, and somewhat elastic. In this mass four or five dark points, seldom more, are observable, which do not lie only on the surface, but penetrate the interior of the globule. They are easily separated from the white mass, whose surface, which was in contact with the dark kernel, is quite smooth. Neither the tissue, the organ, nor the degree of inflammation, has any effect in changing the character of the pus globules, which are the same as found in bone, sinew, muscle, lung, and brain, and as taken from gangrenous, syphilitic, or other sores. This last observation is supported by Valentin, bd. ii. p. 259, 1837.

The diameter of the pus globules is (according to Gueterbock) from 0·0004 to 0·0005 part of an inch, while that of the blood glo-

in a transparent liquid, heavier than water, but easily miscible with it, sometimes undergoing a kind of spontaneous coagulation. In every one of these respects it differs from mucilage, from which it is sometimes a desirable object to distinguish it; the latter being ordinarily of a greenish or yellowish colour, transparent, without taste or odour, of a stringy instead of a globular consistence, lighter than water and not easily miscible with it, and unsusceptible of spontaneous coagulation.* One of the first chemical tests of pus was the hydrochlorate of ammonia, which was proposed by John Hunter, and is said to render pus soapy, while it has no such effect upon mucilage; and a second was proposed by Charles Darwin, who found that if pus and mucilage were severally dropped into ether, sulphuric acid, or water of potassa, on the addition of the pure water the former was precipitated, while the latter was not. Another test has been proposed by Dr Young, and is perhaps one of the best. It consists in placing a little of the suspected fluid between two plates of glass, to be interposed between the eye and a candle; when, if it be pus, there will be the appearance of a corona of colours, with the

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bules, according to Weber (Hildebrand's Anatomie, 4to, Aufl. 1830, bd. i. p. 155), is 0·0002 part of an inch.]—EDITORS.

* [There seems however very great difficulty in distinguishing between pus and mucus, and Mandl (Gazet. Méd. de Paris, No. 27, 1840), after a full consideration of the different tests for ascertaining the distinction between these two substances, comes to the conclusion that the globules of fibrine, mucus, and pus are identical, and that all the globules are the product of the coagulation of the fibrinous material in the serum of the blood, which transudes through the coats of the vessels, so that the distinction must be sought in the fluid alone in which the globules swim.]—EDITORS.

candle in the centre, arising from the globular structure of this fluid; whereas, if it be mucilage, no such appearance will display itself.* Pus does not readily putrefy.† It is said by Gmelin to consist of water, gelatine, albumen, ozmazome, ammonia, and the hydro-

* [The value of most of these tests has been questioned or entirely disproved by later experimenters, and a variety of new ones proposed, which in their turn have been shewn to be as insufficient as the former.

The objection to the first test is, that, being merely an inspissation of the fluid from the concentrated solution of the salt attracting the water, no such effect is produced when the fluid is diluted. Still however this test, and the one with caustic ammonia, which renders pus gelatinous, lately proposed, remain among the best chemical tests.

All Darwin's tests have been disproved by later experiments of Andral (Précis de l'Anatom. Path. tom. ii.), Gueterbock, and others.

It is evident that Dr Young's test cannot be sufficient, since both pus and mucus have been found to contain globules in every respect similar to one another.

The only one of the numerous tests lately proposed, which may be noticed, as it seems to possess considerable practical value, and is easy of application, depends on the greater amount of oily substance in pus than in mucus. Some of the suspected matter should be placed on an iron or platina spatula, and held over a lamp or candle. Pus burns with a bright sparkling flame like resin, while mucus emits scarcely any inflammable gases. When this is not applicable, from the small quantity of suspected fluid, it ought to be digested with absolute alcohol, which dissolves any fat which may be present. (Gueterbock, de Pure et Granulatione. Berolini, 1837.)]—EDITORS.

† [Pus resists putrefaction for a remarkable length of time, as shewn in the experiments of Home, Hunter, Gueterbock, and others. Dr H. Wood (De Puris naturæ atque formatione. Berolini, 1837) took one part of pus and mixed it with three of water, and let it stand in an open vessel in a temperature of from 12 to 15 deg. Reaum. After one week the globules retained their form, the supernatant fluid was limpid, and there was no fœtid odour to be perceived. After two weeks the globules were whiter, and a little changed in form, but had no fœtor.]—EDITORS.

chlorates and sulphates of ammonia, potassa, and soda;* but we gain very little by such statements as these. Such pus, then, is pure, or what is foolishly called laudable pus. Ill-conditioned pus, however, as that resulting from the scrophulous and scirrhous inflammations (the erythematic seldom proceeding to suppuration), differs in many respects from this; that of the suppuration of tubercles having in general the appearance of a colourless transparent fluid, with little clots of gray, cheesy matter floating in it, and being without taste or odour, and of a gluey consistence;† that from the

* [We may here give one of the most recent analyses of pus (from a mammary abscess).

Water,	86·1
Fat soluble in hot alcohol,	1·6
Matter soluble in cold alcohol (fat and ozmazome),	4·3
Matter soluble in hot and cold alcohol (pyina?), albumen, globules, and grains of pus,	7·4
Loss,	·6
	100

In the ashes of pus were found 0·8 of salts, of which 0·7 were soluble in water, viz. muriate, phosphate, sulphate, and carbonate of soda, muriate of potash, muriate of lime; 0·1 soluble in nitric acid, viz. carbonate and phosphate of lime; phosphate of magnesia, and traces of iron and silica.

Pus has been lately represented by Gueterbock to contain a peculiar principle. It is said to be obtained by adding absolute alcohol to a filtered watery solution of pus, when a precipitate composed of albumen and *pyina* is thrown down; this is treated with water, which dissolves the latter. This has however not been confirmed by others: on the contrary, Vogel has sought for it in vain, and believes that it is merely some very much diluted mucus, which, passing through the filter, gives rise to that dull opacity ascribed to the presence of pyina. Valentin likewise disbelieves in the existence of pyina as a distinct principle; he conceives it to be a modification of caseine. (Gueterbock, op. cit.; and Mandl, op. cit.)]—Editors.

† [This presents globules much like other pus, only it contains many more of those conglomerated globules, the consequence of the first stage of inflammation. (Gluge, op. cit.)]—Editors.

encephaloid and melanotic tumours being, in the former of a reddish, in the latter of a blackish colour; and that from the suppuration of the scirrhous tissue being of a brown colour, excessively fœtid, and much thinner than natural.* The pus formed by either the scrophulous or scirrhous inflammations has *not* the power of producing a similar inflammation in healthy parts, which is precisely what we should *a priori* expect, these inflammations being proper to morbid tissues, and therefore incapable of taking place in situations where these tissues do not exist. Attempts of this kind have been made with the scrophulous pus by Goodlad, and with the cancerous matter by Kortum, Louth, and Alibert, but in *all* instances without effect. It remains to be shewn, however, whether such substances applied to an indolent tu-

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* [The fluid of sanies differs chemically from that of good pus, and thus arise the various points of difference in its appearance. It partly dissolves the corpuscules, so that the little molecules are detached, and the shape so altered that they can scarcely be recognised; it deposits crystals and other solid substances, and contains a greater number of oil drops; it also corrodes the tissues, and thus contains fibres, particles of cartilage, particles of epithelium, &c. (Valentin, Repertor., bd. ii. p. 259.)

Gluge (op. cit.), who is distinguished for the accuracy of his observations, after a careful investigation of the subject, comes to the following general conclusions as to the microscopic characters presented by different kinds of pus.

It can be determined with certainty by the microscope whether a given specimen of pus is simple, sanious, or specific; but it is impossible to distinguish the different kinds of specific pus from one another. The simple pus exhibits a transparent liquid, in which only pus globules swim. The sanious pus has, besides those globules, a quantity of granular substance. The syphilitic and variolous have a tough, coherent, grayish-white mass, but neither of these last has any thing peculiar to itself.]—Editors.

bercle, or a scirrhus, would not occasion their inflammation and ulceration. The pus generated by the inflammation of natural tissues has frequently the power of generating a similar inflammation in healthy parts, as in the case of that secreted in lues venerea, perhaps in purulent ophthalmia, and certainly in variola, porrigo, scabies, frambæsia, and hospital gangrene.

Pus may be either diffused on the surface of an organ, without any perceptible source, or it may be generated in a certain point, giving rise to an excavation, called, when in a soft part, a pustule or ulcer, and when in a bone, a caries; or, lastly, it may be deposited within the cellular tissue of an organ, where it constitutes what is called an abscess; and the general tendency of an abscess being continually toward the surface of the organ in question, it is at length commonly converted into an ulcer. In the midst of these ulcers, when healthy, organizable lymph is deposited, which, becoming vascular by an interstitial process, assumes the form of little cones of red and moderately sensible flesh, which take on gradually the character of the surface on which they are situated. It has been supposed by Sir E. Home that these granulations, as they are called, are formed from pus, and not from the lymph; constituting thus an essential difference between the two processes of healing by granulations* and healing by the first intention,

* [Gueterbock (op. cit.) describes granulations as consisting of peculiar fibres, either in fasciculi, or running singly, among which globules of pus and blood float. The breadth of these fibres is somewhat less than half that of the blood globules: they never intersect, but always run parallel with one another. In some cases he

and that the pus can become organized (as he supposes is the case with lymph also) by merely affording a route for the vessels of the neighbouring parts, by the formation within itself, when becoming concrete, of channels, owing to the evolution of carbonic acid. All this, however, is now known to be erroneous.* It is probable, however, that under the same circumstance that pus is of a bad quality, organizable lymph is either not deposited at all, or deposited in insufficient quantity; and it is on this account that ulcers secreting an impure kind of pus, like those occurring in tubercular or scirrhous matter, or other false tissues, have so little tendency to heal; the deposited lymph in such being in general inade-

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could discern blood-vessels in them, which seemed to have no connexion with the vessels of the surrounding parts. He considers pus to be necessary for granulation, and not a mere secretion, since the globules and principal elements of pus are found in the granulation; and concludes that the substance in a wound which heals by granulation is formed " de novo," and not by addition from the margin. (Vide p. 187, Weber's Views of the Organization of Lymph.)]—EDITORS.

* [According to Valentin (Repertorium, bd. ii. 1837), the formation of pus and organizable lymph is merely a modification of the same process, and analogous to the normal development. This is best seen in the diseased products, such as tubercle. The cheesy masses in scrophulous glands, in tubercles of the lungs, &c. consist of microscopic elements, which can scarcely be distinguished from the pus which succeeds them. The corpuscules and molecules are quite the same, and there is only wanting the semitransparent fluid (and sometimes drops of oil) to dilute the mass and increase its quantity, in order to make it true pus.

He describes the formation of pus as consisting of two processes, the first the deposition of corpuscules, and the second the secretion of a fluid to dilute the corpuscules, and thus form pus or sanies.]—EDITORS.

quate to form granulations adapted to the purpose. It is unnecessary to specify the organs in which suppuration takes place, since there are few organs in which such a termination of inflammation is not common.

With respect to the origin of pus, this termination of inflammation was regarded by the ancients as the most perfect example of the concoction of the crude morbific matter whence the inflammation was supposed to proceed; and as it was observed to follow chiefly the phlegmonous inflammation, it was ascribed to the greater energy of the blood in effecting the concoction, than of any of the other three principal fluids. The material, however, out of which, together with the aforesaid crude morbific matter, the pus was directly formed, was at first supposed to be the solid parts, melted down, as it were, by the violence of the inflammation; and this notion was adopted by almost all pathologists down to the time of Platner and Pott, and gave rise to the opinion so long prevalent, that pus could not be formed without ulceration, or some palpable breach of continuity in the solid parts. Others, again, supposing that the "too too solid flesh" was not to be thus "thawed and dissolved," considered pus as nothing more than effused blood, which had become changed by stagnation,—an opinion adopted by Gaber, Sir J. Pringle, and Dr Cullen. The modern doctrine, that pus is a secretion, was propagated by Dr Simson of St Andrews, De Haen of Vienna, Morgan of Philadelphia, and Brugmann, and was subsequently fully established by Hunter, Cruickshanks, and Hewson.

The last and worst consequence of inflammation is *gangrene* or mortification, the most perfect degree

of which is called sphacelus. In this state the part affected becomes disorganized, and the blood, if pressed out of its vessels, does not return. It is of a brown or black colour, exhales a putrid odour, and frequently contains bubbles of air, generated now *really* by putrefaction. If a soft part, it is flexible, easily torn; but if a bone (in which case the affection is called necrosis), it retains its hardness, but is easily splintered. Gangrenous parts are often distinguished from the neighbouring healthy parts by a decided line of demarcation, the vessels of the latter in contact with the dead mass becoming inflamed, and depositing a fluid, by which this mass is at length separated, and thrown off in the form of what is called an eschar if formed on soft parts, and an exfoliation or sequestrum if formed on bone; and accordingly, gangrene, though generally fatal when it occurs in important parts of the body, is not always so, since a portion of these parts may be thrown off without material injury, and life preserved. In this way many feet of mortified intestines have been voided by the anus in cases of intus-susception, &c. The occurrence of gangrene is indeed sometimes the most favourable thing that can happen, since, by the separation of parts so produced, diseases otherwise incurable, as an internal aneurism, or a cancer of the mamma, have not unfrequently been radically cured.

Gangrene, like suppuration, may occur, as a consequence of inflammation, in almost any organ of the body, unless the importance of that organ be such as that the inflammation of it necessarily proves fatal before it can have proceeded to this effect. Most of the cases of reputed gangrene of the heart were pro-

bably incipient suppuration, and most of those of reputed gangrene of the stomach really perhaps melanosis. It is probable, also, that when the brain has appeared to be affected by gangrene, the affection was rather that called ramollissment, or incipient suppuration, although almost a directly contrary view of the subject is taken by some authors, who regard the ramollissment rather as a species of gangrene. Analogy, however, and the very obscure degree of inflammation which in general precedes it, are decidedly against the latter opinion. Gangrene of the spleen, intestines, liver, pancreas, urinary and genital organs, and indeed of every other organ of the body, with the exception of those just noticed, is sufficiently common.

Concerning the nature of gangrene, it has always been ascribed with propriety to the death of the parts affected; and the death of the whole body, which, if the affected parts be not thrown off, is a common result, is to be ascribed to the contact of the putrid mass acting on the living tissues, like a kind of poison. The principal question with respect to gangrene is, by what process the gangrenous mass is so frequently separated from the sound parts. It probably acts like a foreign body, exciting a new inflammation of the contiguous parts, and a new secretion, which is thus interposed, almost in the manner of a cyst, between the dead and living parts.

The displacement of parts (constituting almost the only other organic proximate cause of disease besides inflammation and its consequences) includes intussusceptions, hernia, cystocele, encephalocele, prolapses of the anus, vagina, and uterus, eyelids (either inwards or outwards) and iris, as well as inversion and retro-

version of the uterus, extra-uterine conceptions, miscarriages, some kinds of difficult parturition, and lastly, fractures and dislocations. On this subject however in general, abstractedly from the consideration of the individual diseases which it includes, and with which it is not our province particularly to interfere, it is not necessary to make any remarks.

CHAP. XVI.

FUNCTIONAL PROXIMATE CAUSES.

SPASMS—CRAMPS—DISEASES INCLUDED IN THE CLASS OF SPASMS—ANCIENT OPINIONS REGARDING SPASMS—TREMORS—CONVULSIONS—PALSY.

We come now to speak of the functional proximate causes of disease, in which, it must be remembered, any change of organization for the most part eludes observation, the chief thing noticed being some change of function; and as the term function is synonymous with action, it follows that all such proximate causes of disease must be referrible to one or other of the three heads of increased, irregular, or diminished action, the result necessarily of some increase, irregularity, or diminution in either the *susceptibility*, or the several kinds of *stimuli*, upon which all such action depends. One of the chief agents in the performance of the greater number of the functions (if not of the whole of them) is muscular contraction; and hence one of the chief things to be considered at present is any increase, irregularity, or diminution in their natural action, to which the muscles are from various causes liable.

To the first of these heads belong all kinds of spasm or cramp, which, like immediate cause of appetite, and the labour-pains already spoken of, when on the sub-

jects of digestion and parturition, seem to consist in an inordinate contraction for a longer or shorter time (but always with occasional remissions) of more or fewer of the fibres of any muscle, whether of involuntary or voluntary motion, and probably often through a part of their length only, so that they are dragged away as it were from the rest. We have elsewhere presumed that the muscles during life are always, even where most at rest, in a state of moderate contraction (any cessation of which gives rise, if intermitting, to tremors, and if continued, to palsy); and that, when in action, more or fewer of the fibres of each may be called into play, as in the instance of closing the jaws more or less forcibly. In spasm or cramp, however, it is probable that not only more or fewer fibres may be called into action, and that this action is to a preternatural degree, which may sufficiently explain both the knotted appearance which such muscles frequently present, and the violent pain with which such contractions are frequently attended, but also that it extends often through only a portion of the length of the respective fibres, since it is not easy otherwise to explain why the extremities of a muscle are not always approximated by such contractions. It has been elsewhere observed, also, that we have no proof that the irritability of muscles is ever primarily greater at one time than at another, so that we must attribute their morbidly increased action to the more or less permanent increase, when in the involuntary muscles, of their usual stimuli, such as caloric, chemical and mechanical agents, passions, sympathy, or the constant stimulus derived from the brain; and when in the voluntary muscles, to a more or less

permanent increase, either of any of those stimuli just mentioned, or of the occasional irritation usually set in action by the will alone. The increased action of which spasm consists, like that which always precedes inflammation, is excited not only by positive agents, but sometimes by negative agents also, as cold; in which cases the supervention of spasms, like that of the increased irritation which precedes inflammation, can be explained only upon the presumption that such negative agents give rise to the accumulation of irritability, and operate consequently as indirect stimuli. Spasm is not, like inflammation or fever, divisible into stages; nor (being always in the same tissue) distinguishable, like the former, into various species, according to its immediate seat; nor, lastly, does it, like inflammation or fever, leave behind it any sensible effects; but it is, still more remarkably than they are, disposed to depart and re-appear at intervals more or less regular.

The class of spasms properly includes (among those enumerated in the chart) angina pectoris, spasm of the gullet, gastrodynia, colic, spasm of the sphyncter ani, spasmodic ischuria, priapism, trismus, and tetanus; but the particular nature of each of these affections may be better considered under the head of Semiology, since it is from a contemplation of their symptoms alone that we can form any opinion upon the subject.*

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* By the first pathologists, spasms, convulsions, and palsies, as well as inflammation and fever, were regularly attributed to inordinate flows or depravations of one or other of the four established humours, or to some change *in the essential properties* of the tissues, without any peculiarities in these fluids; and it was the latter doctrine, as was

The head of increased action also comprehends, besides spasm, every increase of sensation, thought, and voluntary motion. The properties and powers on which those functions depend have been elsewhere represented as resident in certain parts of the spinal marrow and brain, and developed in proportion to the

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before observed, which laid the foundation of the division of proximate causes of disease into organic and functional. It is proper to remember that the ancients, from the time of Erasistratus, called almost every functional disorder by the name of paralysis or palsy, distinguishing this into two kinds, the one conductio, deductio, &c. which signified what is now called a spasm or convulsion, the other by extensio, solutio, &c. which signified what is now specifically called palsy; nor was it to muscular parts alone (with the proper tissue of which indeed they were for a long time unacquainted) that these terms were applied, since we find them speaking of a paralysis (*i. e.* either a spasm, convulsion, or palsy) of the lungs, of the liver, of the peritoneum, of the vasa deferentia, of the spleen, of the nerves of sensation, and so forth. When describing the more gross and palpable affections of muscular parts, it was usual indeed among the ancients to employ the term tetanus or rigors to signify what we now call spasm, or, as the nosologists used to call it, tonic spasm; and the terms spasmos, conductor, deductor, &c. to signify what we now call convulsion; while the terms paralysis, extensio, solutio, were employed to signify what we now call palsy; but it was almost exclusively to more palpable affections of this description (as in the case of epilepsy, tetanus, paraplegia) that these terms (sometimes used indeed with very little discrimination) were in general applied. It was not till the time of Hoffman and Cullen that the modern application of these terms in general, and of spasms in particular, was commonly made; and that, while all the affections in question were established to take place in muscular parts, they were extended to parts, of the muscularity of which previous pathologists had no idea. Thus even inflammation and fever have been (from the extensive use of these terms) confounded with functional affections, essentially consisting, like those of which we are now speaking, in change of action; but the distinction may still be drawn between these and proper functional diseases, although, as has been before remarked, it is an arbitrary and convenient rather than a real and essential one.

degree in which these parts are deposited, which is always, *cæteris paribus*, in proportion to the quantity of blood which their capillary arteries contain. It hence follows (and it is of essential importance to keep this circumstance continually in mind) that those diseases of the animal functions which consist in increased action with respect to these functions, are in reality diseases of diminished action with respect to the organic functions, and *vice versa;* the increase in the vivacity of sensation, thought, and voluntary motions being in all probability the result of a laxity (analogous to inflammation) of the capillary arteries of those portions of nervous matter in which sensibility, the faculty of thinking, and the power of exciting voluntary motions reside. It is to this head, accordingly, that nyctalopia and other diseases, consisting principally in a preternatural sensibility of certain organs, properly belong, although, it is true, they often arise from other causes, some of them organic. Lastly, natural sleep has already been described as arising from a periodical diminution of all the animal functions, sensation, thought, and voluntary motion; and it will hence follow, that when this state is imperfect, that is to say, when sensation and thought remain, while the power of voluntary motion alone is suspended (as in incubus), or while the power of voluntary motion remains, while sensation and thought are more or less impaired (as in somnambulism), it must be regarded as increased action, with respect to the animal functions in question (though of course diminished action with respect to some of the organic functions), and therefore properly falls to be considered in this place. To the head of irregular actions belong convulsions

and tremors, the former of which differ from a spasm or cramp in the preternatural contractions being never in any degree permanent, but immediately succeeded by remissions (owing to the inordinate stimuli on which they depend being applied only at intervals); while tremors differ from both in the motions of the part affected being the result, not of the *increased* action of the muscles in question, but of the *diminished* action of their antagonists. It has been elsewhere remarked, that, presuming the muscles, even when at rest, to be always in a state of moderate contraction (flexors and extensors equally), we might *a priori* imagine that motion was always affected, not by the contraction of the former, but by the relaxation of the latter (though this is not true); and such is sometimes the cause of motion, as in the rolling upwards of the eye during certain emotions, the chattering of the teeth from cold, and the violent motions of the whole body during the cold stage of an intermittent fever. These motions, however, constitute tremors, and must not be confounded with convulsions. They take place because (from the diminution of their natural stimuli) the natural contraction of some muscles is at short intervals suspended, so that the full effect of that of their antagonists at these times displays itself, and that sometimes so forcibly as very much to resemble a strong convulsion. The latter, however, differs from them in the motions now depending, not in the less contraction than natural of some muscles, but in the greater contraction than natural of others. In both cases there is a loss of balance displaying itself at short intervals; but this depends, in the case of tremors, upon the weight in the one scale being di-

minished, but, in the case of convulsions, upon the weight in the other scale being augmented. Both belong to the head of irregular action; but tremors are more allied to palsy, and convulsion to spasm. In fact, a convulsion has been not unfrequently called a clonic spasm, while a proper spasm has been distinguished by the name of tonic.*

To the head of perturbed action is likewise referrible any irregularity either in sensation, thought, or voluntary motion (not constituting strictly either convulsion or tremors), for the same reason that any increase of these functions belongs to the preceding, the increase and diminution of these functions being indicative respectively of a diminution and increase of the organic functions, as before observed. To this head seem to belong insanity and delirium tremens, as well as very remarkable symptoms of many other diseases. To the head of diminished action as a proximate cause of disease belong palsy in general, which is the direct reverse of a spasm, and consists in a less than natural contraction of muscular fibres, whether those of the voluntary or involuntary muscles, arising in general from a deficiency of some one or other of the stimuli already spoken of, and is produced either at two removes, or at one, according as the exciting cause has been either sedative or stimulant. A momentary palsy occurring at irregular intervals constitutes, as has just been remarked, a tremor. In cases of perfect palsy, the natural moderate contrac-

* The head of convulsions and tremors properly includes (among the diseases enumerated in the chart) pertussis, palpitation of the heart, hydrophobia, epilepsy, systemic chorea, shaking palsy, and barbiers.

tions of the muscles (in a proper degree of which we have elsewhere presumed a sensation of alacrity and vigour to depend) are entirely wanting, and, *a fortiori*, those greater contractions on which motions depend are quite impossible. The causes of palsy commonly consist either in some abstraction of the natural stimuli, or some defect of those portions of the nervous system (*i. e.* of either the respiratory or motific portions) upon which the conveyance of many of these natural stimuli depends; but they may reside also in some defect in the muscular tissue itself (improperly called palsy), by which it is rendered incapable of obeying these stimuli, however well conveyed to them. Such is presumed to be the case in that reputed kind of palsy which results from the poison of lead, by which the muscular fibre is preternaturally relaxed (the result of any constriction), and is certainly the case in that reputed kind of palsy which frequently occurs after repeated attacks of rheumatism, by which the muscular fibre has been indurated, or otherwise disorganized, and constitutes the paralytic rheumatism of Dr Duncan. The head of palsies may be made to include asthma, asphyxia, syncope, palsy of the gullet, dyspepsia, palsy of the tongue and sphincter ani, and impotence, to omit hemiplegia and paraplegia, which, as arising generally from some organic lesion, do not belong to this place. This head will include hemeralopia and amaurosis, idiotism, nervous apoplexy, and catalepsy, as well as too constant or too profound sleep, and many other symptoms of diseases not commonly enumerated as diseases themselves. To this head of diminished action also is referrible every diminution of

sensation, of thought, and voluntary motion (not amounting to palsy properly so called), for reasons already stated; and for the same reason a diminution in these animal functions indicates a diminution or corresponding increase in the organic function connected with them.

SEMIOLOGY.

CHAP. I.

NOSOLOGY.

SYMPTOMS, HOW OBSERVED BY THE ANCIENTS—CLASSIFICATION OF DISEASES BY SYMPTOMS—SYSTEMATIC NOSOLOGY A USELESS SCIENCE—EXAMPLES OF ITS ABSURDITY—DIFFERENT SYSTEMS—TERMINOLOGY—NAMES DO NOT DESCRIBE THE THING THEY SIGNIFY.

HAVING now sufficiently discussed the subject of Etiology, or the consideration of the causes of diseases, predisposing, exciting, and proximate, we next come to that of Semiology, or the consideration of the symptoms by which diseases are distinguished, and the rationale of each, as far as this can be deduced from our knowledge of the structure and actions of the body in a state of health, and the morbid changes, organic or functional, to which these are exposed. From what has been already said with respect to a proximate cause and a disease, it necessarily follows that every individual symptom is in fact itself a disease, and has its own particular proximate cause; but as the term disease is commonly and properly applied only to a collection of more or fewer of

such symptoms, all arising from one general proximate cause, it will be proper to treat in this place of some of the more common of these symptoms, each considered abstractedly, without reference to the numerous others with which it may be combined in order to constitute a disease properly so called. It was in the observation of the symptoms of disease that the earlier physicians particularly excelled, and it is chiefly on account of the minute history which they contain that their works are otherwise than as mere curiosities of any value. Coarse and inaccurate in their anatomy, fanciful and systematical in their physiology, vague and mistaken in their etiology, and at once inert and complicated in their therapeutics, they have nevertheless left behind them much more accurate histories of diseases than the moderns, so far excelling them in all the sciences just mentioned, are accustomed to enrich their works withal; although perhaps this very excellence in the more recondite and essential branches of their profession, in addition to the systematic method of handling symptoms first introduced by the nosologists, is one of the chief reasons of their neglecting, if not to observe, at least to note down, many of the more superficial and adventitious marks of disease.

But with the ancient physicians, who, not satisfied with making a daily visit of some five or ten minutes, used to remain like sick-nurses for hours and days by the bedsides of their patients, watching for the appointed signals to administer their remedies, the symptoms of diseases were all in all; and the scrupulous accounts of these left by Hippocrates, Celsus, Cælius, and Aretæus, though perhaps it would be

superfluous in the present day to emulate, cannot be otherwise than highly advantageous to study. In modern times, and in our own country, these ancient collectors of symptoms have been imitated most successfully perhaps by Sydenham and Heberden; and the more recent works of Doublet, Marshall Hall, Buchan, Haspar, Martinet, and others, on the art of detecting diseases, cannot be consulted without great advantage, and must by no means be confounded with the frivolous labours of the nosologists in attempting, not to *detect* diseases, but to *appoint* and to *class* them by their symptoms alone. The object of the former is more philosophical, and their tendency much more useful; but it must be remarked at the same time, that any written observations can help us, comparatively, but very little on this subject, by far the most important data in discriminating diseases being obviously incommunicable by words; and that it is equally impossible to teach men by precepts how to detect a disease, with which a little practice will make them familiar, as to instruct men by stated rules how to distinguish one face from others, although, had they once seen it, they would immediately recognise it, as it were intuitively, among ten thousand. To make, however, circumstances more or less accidental, instead of such as are essential to them (like their seat and nature), a ground of distinction and arrangement, as if diseases, or collections of symptoms, were actual entities, is in the highest degree visionary and absurd.*

* The infinite deal of nothing, called systematic nosology, which, under the misnomer of a science, has so long obstructed and obscured medicine, seems to have been first hinted at by Plater, early in the seventeenth century; and Plater has been accordingly likened lately,

It has been the object of systematic nosology, in the state of uncertainty with respect as well to the number of specific diseases as to their most commodious arrangement, to establish both these points; but, from a fatal misconception of the fundamental principles upon which the establishment of distinct morbid affections should be attempted, and a pernicious misapplication of a method of classification so happily pursued with respect to the several objects of natural history, it has completely failed in its object, and is accordingly at present very generally and very justly neglected. Instead of endeavouring to establish, as the basis of their distinction, some definite difference in the necessary conditions of diseases, such as the distinctive structure and function of the several component parts of the body, and the particular morbid changes, whether of structure or of function, to which each of these parts is subject; and having admitted so many and no more distinct morbid affections as there were actual entities, or real substantial causes for them,—delivering under their respective heads the collection of symptoms by which each is commonly known; nosologists have in general not only confined themselves, in their establishment of

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by one of the most pompous of the nosologists, to the morning star, which twinkles, as he says, in the midst of darkness, and leads on to the brightness of day. The regular birth of systematic nosology, however, or the art of appointing and classing diseases by their symptoms, took place in 1731 with Sauvages at Montpellier, whose work, however, was not perfected till 1768. In the mean time, a similar task was undertaken by Linné at Upsal, and by Vogel at Göttingen, who published their systems respectively in 1759 and 1764. In 1769, Cullen appeared in the field, and after him in succession Selle, Sagar, Macbride, Plouquet, Darwin, and Parr.

individual diseases, to their symptoms, but, not contented with this abuse of ontology, have packed them according to all sorts of relations, real and imaginary, into shadowy fabrics of genera, orders, and classes, composed respectively of symptoms more and more general, and each distinguished by some cacophonous name, the invention of all which, far from illustrating the distinctive value of morbid affections, has served only to substitute the interminable and incongruous fictions of a misplaced art for the comparatively few and simple realities of nature, and thus to divert the student from the contemplation of things themselves, by trammelling his mind with chimerical systems, founded on principles fleeting and untangible as the winds and clouds, and held together by relations which have frequently no existence but in the brain of the nosologists. It is needless to enter into any consideration of the comparative merits of authors on a science which owes its origin to error and its continuation to frivolity, and which, founded as it is on principles which " come like shadows, so depart," has probably done more to retard the progress of true pathology than almost any modern science has done to advance it. Perhaps, if any such unreal mockery is to be followed, that of Cullen, as being the least perfect as a system of nosology, and the most so as a description of diseases, is the best. But the only excuse for artificial classification at any time is, that the number of individuals is too great for the memory otherwise to retain them, and such a classification is possible only when we have fixed and immutable data to proceed upon. Such a classification, then, was at once desirable and attainable with respect to the objects of

natural history, the countless myriads of which could not otherwise be comprehended, while each individual, obviously distinct from every other, is furnished with some unvarying marks, which are proper to itself; with others, which it has in common with a few; with others, which it has in common with a greater number; and with others, which it has in common with still more; so that here the establishment, not only of the species, but its genus, order, and class, has in it something fixed and definite, and no two persons acting on the same data can dispose of it differently. But how totally different is the case with respect to morbid affections, which, numerous as they are, are still not sufficiently so to stand in need of any artificial classification, and the several examples of which, far from being determinable as distinct entities, by their symptoms alone would frequently require, on this principle, a dozen different names and situations in an artificial system, in the different stages of their progress; while in no one stage are these symptoms so uniform as to determine with certainty their proper place. But, to omit anomalous cases, let us take a well-marked case of any reputedly individual morbid affection—for example, hydrocephalus—and endeavour to find its proper place in a system of nosology. With respect to the class, supposing we follow Cullen, is it a pyrexial disease? It is often attended with symptoms of fever. Is it a nervous disease? It generally betrays many marks of disorder of the nervous system. Is it a cachectic disease? It is sometimes accompanied by symptoms supposed to indicate a bad habit of body. Is it a local disease? All diseases are in some sense local. So much, then,

for a firm foundation, and the difficulty increases upon us as we descend to the order. Dissection tells us it is a dropsy, and most dropsies are attended, among twenty other symptoms, with an evident tumour, and are arranged therefore with tympanitis, polysarcia, swelled viscera, &c. into an order called intumescentia. But hydrocephalus has usually no tumour, and therefore cannot stand in this order. Some other of its twenty symptoms, then, must be selected for the purpose of establishing its order, and perhaps a different one may be selected by nineteen different nosologists; and it must thus be torn from its natural place among the dropsies (under whatever order they may stand), from wanting one symptom of dropsies in general, and must be packed with other diseases totally discordant, from possessing another. But the genus at least is certain; it is unquestionably hydrops. No: for in this ingenious way of separating similar and uniting dissimilar affections, it does not stand with the rest. Who can have any patience with such unnatural and arbitrary trash as this, and who can hope for a better arrangement founded on such principles, when we find one of the most recent authors on the subject, and one who has animadverted pretty strongly on many of the absurdities of preceding nosologists, after making a distinct genus of dropsy, marshalling it with emphysema and urinary calculi, under the order catotica, of the class eccritica! Fortunately the real and manly study of pathological anatomy is rapidly superseding, in the present day, this distressing drivelling, and leading us, not indeed to neglect Semiology (the cause of which has been much more injured than promoted by the nosologists), but to seek for more substantial

ground than this can afford, on which to found a systematic arrangement of morbid affections; and in bringing about this happy reformation, recent nosologists have been unintentionally highly instrumental.*

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* Subsequently to the time of Cullen, have appeared the nosological systems of Pinel, Swediaur, Young, Parkinson, and Mason Good. But Pinel must not be confounded with nosologists properly so called, his nosological nonsense being more than compensated for by his anatomical precision, and *his* being in fact one of the works to which modern pathology is most indebted. The system of Swediaur is not very unlike that of Cullen, and in so far as little objectionable as possible; while those of Young and Mason Good (the former of which is accommodated, as the author expresses it, to the strictest rules of the Linnæan philosophy, and the latter, founded, as the author represents, on a physiological instead of an anatomical basis, is a professed attempt to connect the science of disease with what he chooses to call the " *sister branches*" of natural history) are incomparably the worst, because the most complicated which have yet appeared, not excepting the jeu d'esprit of Parkinson, the declared object of which is to render medical arguments logical and incontrovertible, medical conversation dignified and admired, and the medical profession exalted and revered! Happily the medical profession in general knows and cares very little about any of these systems, the alliance between nosology and nonsense being too palpable to escape the meanest capacity, and the profession is thus less ridiculous than nosologists have laboured to make it; and the ill-timed sneer at pathological anatomy, when put in competition with nosology, emitted some time ago by one of this fraternity, against the translation of the deservedly celebrated Bayle (a man who has done more for pathology than all the nosologists, to whatever class, order, genus, or species they may severally belong, that ever existed), has contributed not a little to open the eyes of people to their comparative merits. Added to this, the exposure still more lately made in this country, of the most deplorable deficiency of sound principles, not only in pathology, but in almost every branch of medical science, in a practical work of high pretensions,—a complete " momentum exegi" affair,—written, we trust, by the last of the nosologists, and of which (to say nothing of its sins of commission) it has been most truly remarked, that, bulky as it is, a much better work might have been written from what it has omitted than what

Nor is it the least of the inconveniences which have attended the invention of systematic nosology, to introduce a kind of gibberish into medical language, almost all nosologists having been in the same degree "onomatomaniacs." But if the attempts at reforming the language of anatomy, as displayed with respect to the nomenclature of the muscles and arteries, were as frivolous as they have been in general unsuccessful, what shall we say to those which have been successively made in modern times to designate in an appropriate manner, not only the imaginary classes, orders, and genera of diseases, but real *bona fide* diseases themselves? It is a mere truism to say

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it contains, will, it is hoped, by displaying the general inadequacy of nosologists to throw any real light upon medicine, tend to put a stop once and for ever to this mawkish species of serious trifling, and to remove from the study of the profession the wretched incubus by which it has been so long overlain.

So much, then, for the attempt to appoint and arrange diseases in general by their symptoms, of which we may perhaps say as Terence says of the attempt to make love by rule,

> " ————Incerta hæc tu postulas
> Certa ratione facere, nihilo plus agas
> Quam si des operam, ut cum ratione insanias."

While on the subject of nosology, we cannot avoid noticing the extreme facetiousness displayed by some certain nosologists in animadverting on the nonsense of the fraternity in general, albeit utterly blind to their own proper absurdities. Why is the itch, says the author just alluded to, chuckling in the conscious pride, at once of his acumen and his humour,—why is the itch like a broken bone? Do you give it up? Because, forsooth, he replies, it is a dialysis.

But what would he have done had a man of common understanding, peradventure equally addicted to conundrums, asked him in return, why hydrocephalus was like a urinary calculus? The most impudent man alive could hardly have answered seriously, because it is a catoticum.

that clear and definite terms are conducive to clear and definite conceptions. Everybody knows that; but everybody knows, at the same time, that perfectly precise terms may be used in explaining the supposed nature of a disease (continually varying, of course, with the progress of science), by whatever name the disease itself is designated; there is no manner of occasion for a name to convey, at any time, a description or definition of the thing it signifies; and perhaps it is much better, in the still imperfect state of pathological science, that the names of diseases should not do so. It is in many cases a fortunate circumstance, as acutely remarked by Dugald Stewart, "when the words which we employ have lost their pedigree." But whether they have lost their pedigree or not, who ever allows the etymology of the word synocha or synochus to interfere with his conception of the nature of the disease so called? And with regard to classical derivation, who but a pedantic pedagogue, an arrant Holofernes, ever feels offended at the abominable terms scarlatina, frambæsia, and many others, which have excited such excessive horror in some hyperclassical writers? They are not, it is true, the best terms that might have been chosen, but it is too late to choose now.*

* Nothing in the name of a hog, for instance, indicates the thing signified; but we understand what is meant by the word hog as well or better than we should by the mere account, because more characteristic, such as long snouto, four footo, thick skinno, beastly dirtyo, and that is about sufficient for any useful purpose. It is quite sufficient, moreover, that, as mere arbitrary signs, the names of diseases be distinctly and generally understood; which must soon cease to be the case if every body be to assume to himself the privilege of obtruding at will his "ora magna sonantia" upon the world, and of

Besides, a fastidiousness which is merely futile with respect to the names of the parts of the body which are always the same, is in the highest degree unphilosophical and absurd with respect to the names of diseases which are perpetually varying, and many of which would consequently require the whole stock in trade, from the "*as*" down to the "*rhœas*," to designate them accurately in all their several stages; for if under one name all the phenomena of these several stages are to be happily embraced, the old established limits of a foot and half would take in only a fraction of most of the words which must be put in requisition. For example, cynanche trachealis or croup, which has successively borne the names of suffocatio stridula (Home), catarrhus suffocativus (Hillary), cynanche stridula (Crawford, Wederburn), angina inflammatosa infantilis, angina epidemica (A. Miller), angina polyposa, angina suffocativa (Baird), asthma infantilis (Miller and Bush), morbus strangulosus, plastic inflammation of air-passages (Laennec),

altering established terms as often as he pleases, agreeably to his notions of propriety and euphony. No man has a right to expect, in the present day, that his new nomenclature of diseases, however abstractedly excellent, will supersede all others,—that medical men will, in a body, consent to call the diseases just mentioned, for example, respectively enecia, cauma, emprisma, paristhmitis, œnanthesis, rosalia, and anthrasia rubula (even admitting that they could, like the augurs of old, keep their countenance when doing so), and that all people will use his prefixes and affixes, his *as*, and *ens*, and *dypes*, his *agras* and *itisses*, his *algias*, and *rhagias*, and *rhœas*, precisely as he wishes; and if they will not do so, his new nomenclature must either do nothing or do harm, and contribute to convert the language of medicine into a discordant and repulsive jargon, and to render medical men as unintelligible to one another as were the bricklayers of Babel.

diptheritis (Bretonneau), has lately been dignified with the name of deuto-frangibalus-broncho-laryngo-tracheitis-mixo-pio-meningitis, and this probably is but a simple specimen of what we must expect if this mania be not resolutely checked. But the whole conceit is the very antipode of common sense, and quite unworthy of the age in which it has been introduced. The ancients were much wiser in this respect than we. It behoves those, says Plato, who are engaged in the study of great and serious matters, not to be over-solicitous about names; and Galen, in his Methodus Medendi, after mentioning the various and frequently ludicrous sources of the names of diseases in his day, recommends the student of medicine, as in Athens and other places, to engage with all his might in the study of things themselves, but not to tease himself more than is necessary about their appellation. We hope to be excused for having taken up a little more time than might appear necessary in these tirades against nosologists and nomenclature, since we could not help feeling solicitous that others might, as far as possible, be spared from all labour in acquiring things absolutely valueless in a profession in which so much must be undergone in the pursuit of things creditable and useful.

CHAP. II.

ANATOMICAL SYMPTOMS.

ALTERATIONS IN LARYNX AND CHEST—PERCUSSION—AFFECTION OF ABDOMEN—TUMOURS OF GROIN, OF GENITAL AND URINARY ORGANS—ORGANS OF THE SENSES—NOSTRILS—EYES—MOUTH—SKIN—AFFECTIONS OF SPINE—ORGANS OF VOLUNTARY MOTION.

We proceed now to consider the symptoms of diseases, or the obvious marks by which we are led to infer some morbid change of either organization or function in some part of the body.

The arrangements of the symptoms of diseases proposed by various authors have been extremely different, but all, for the most part, very vague and inapplicable. One common practice has been to arrange these symptoms, after Gregory, under the three general heads of altered appearances, uneasy sensations, and disturbed functions; the first head being intended to include all those symptoms which a medical man can immediately ascertain without proposing any questions to his patients; the second, all those of which the patient is accustomed to complain; and the third, all those not distinctly referrible to the preceding, but generally to be deduced from them. But a very little reflection must shew us how very inadequate, and even illogical, is this arrangement: inadequate, since there are many symptoms, such as increased heat of the surface, for in-

stance, which are referrible with equal propriety to any one of these heads; such heat of the surface being, in the first place, immediately perceptible without any inquiry; giving rise, secondly, to an uneasy sensation, of which the patient may complain; and implying, in the third place, a perturbation of the function of calorification: and illogical, since the last proposed head, or that of disturbed functions, evidently involves the second, or that of uneasy sensations, sensation being as much a function as any other of the body; and the further we investigate this classification of symptoms, the more objectionable it becomes. Other authors, aware of the difficulty of arranging symptoms as applicable to diseases in general, have proposed confining such arrangements to those of individual diseases, calling them, whatever be their nature, commemorative when they indicate what has already passed, diagnostic when they indicate what is present, and prognostic when they indicate what is to come; the two last being further subdivided, the former into pathognomonic, common, and accidental; and the latter into acritical and critical. But all this, besides being in the highest degree artificial, and calculated to confuse much more than illustrate the subject, is totally useless with respect to symptoms in general, considered in the abstract, since what is commemorative in one, may be diagnostic in another, and prognostic in a third. By far the best arrangement of symptoms in general—as the one most immediately understood, and most generally applicable—is into what may be called the anatomical and physiological symptoms; the former including all the changes which may take place in

the aspect and sensible properties of the body (considered in a state, as it were, of asphyxia), without regard to any of the functions which it may be performing; and the latter including all the changes which may take place in these *functions*, without regard to any aspect or sensible properties which the various parts of the body may have assumed: and we shall accordingly proceed to the consideration of the several symptoms of disease, after this general order; speaking, first, of the alterations in the aspect of the several organs subservient to the functions, in the order in which these functions have been already considered,—as respiration, the action of the heart, digestion, generation, sensation in general, thought, voluntary motion, &c.; and, next, of the alterations in the processes of these functions themselves. To the first of these heads belong all the changes in the aspect of the throat and chest, as well as all the indications with respect to the condition of the latter organ afforded by admeasurement, by succussion, and by percussion.

The throat may be deformed by tumours of various kinds, as those arising from the tuberculated conglobated glands, a scirrhus of the thyroid gland, or a bronchocele, the general appearances of all which have been already described. The last is at first in general partially divided by a longitudinal chink, corresponding to the space between the two lobes of the organ: within the fauces also the tumid state of the margin of the larynx in œdema of the glottis is sometimes perceptible by drawing forwards the tongue: the principal seat of the deposition in this disease is the lateral ligaments of the epiglottis. Partial tumours of the

chest may occur from various causes, as inflammation of the mamma, or a tuberculated, encephaloid, or scirrhous condition of that organ; or from some internal disease, as an aneurism of the arch of the aorta, which, producing an absorption of all the interposed tissues, may point either anteriorly or posteriorly. Sometimes also one side of the chest is larger than the other, or preternatural sounds are heard upon the body being shaken, or the sound emitted on striking the chest is more or less clear than natural. Admeasurement of the chest is effected by passing a tape from the spine to the sternum on each side, and is adopted to ascertain merely any disproportion between the two sides, arising from disease, as the constriction of one side from adhesions of the pleura, or its enlargements from hydrothorax, empyema, emphysema of the lungs, or pneumothorax. What is called succussion is made by slightly jerking the body from side to side, and is adapted to shew the presence of a liquid combined with air in the sac of the pleura, as in pneumo-hydrothorax and pneumo-empyema; the sound being similar in these cases to that produced by shaking a bottle partly filled with liquid. Percussion, again, is made by slightly tapping the chest with the tips of the fingers, either directly on the chest, or through an intervening slip of ivory called a pleximeter; and is adopted to indicate sometimes indeed emphysema of the lungs and pneumothorax, or a large cavity in this organ produced by an abscess, by the preternatural *clearness* of the sound emitted, but more frequently the presence of some impediment of the air-passages within this cavity, by the preternaturally *obtuse* sound which the chest emits, as in peripneumo-

nia, hepatization of the lungs, a collection of tubercles or other false tissues in this organ, œdema of the lungs, or pulmonary apoplexy, as well as hydrothorax, hæmathorax, empyema, and dropsy of the pericardium.* The rationale of all the symptoms just spoken of, as indicated by the various means in question, and as occurring in the several diseases, is too obvious to require any particular explanation. The two methods of admeasurement of the chest and succussion, as indicating the conditions of the respiratory organs, have been employed, in one way or other, from time immemorial; but the method of percussion was

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* [Besides the distinction made into a clear and a dull sound, Dr Skoda of Vienna has introduced the following divisions.

1st. From a full to an empty (leer) sound. A full or sonorous sound is one which appears as if coming from a large vibrating surface, as, for example, a large bell or an inflated stomach, in contrast with a small bell or a portion of inflated intestines, which gives an equally clear but empty sound. A large portion of healthy lung gives out a clear full sound, while an equally healthy but circumscribed portion of lung gives out a clear empty sound.

2d. From a tympanitic to a non-tympanitic. This distinction depends not, like the former, upon the size of the vibrating body, but upon the state of tenseness or relaxation of the parietes that enclose the vibrating air. Thus a stomach or portion of intestines, if moderately distended, gives out a tympanitic sound, but if tensely stretched, the sound is no longer tympanitic. This tympanitic sound is heard when the air-cells have lost their elasticity, and are not too much distended with air; for example, in the immediate neighbourhood of hepatized parts, while air is still contained in the pulmonary cells, which from incipient inflammation have lost their elasticity, and after resolution has commenced, when the same conditions are present, and many other similar conditions, sometimes depending on the air-cells, sometimes on the parietes, as in pneumothorax.

3d. From a high to a deep sound. This, in a practical point of view, is comparatively of little value.]—EDITORS.

particularly recommended for the first time in 1761, by Auenbrugger, as a means of shedding no little light upon the otherwise obscure diseases of the organs contained within the chest; and it was deservedly much relied upon by Corvisart and others, although it has been comparatively neglected since the introduction of the stethescope. The present, however, is not the place for speaking of this instrument and its uses, since it is applicable only in ascertaining alterations in the *functions* of the organs contained within the chest, and does not, like the former, afford any indications when these functions are suspended. It would be improper to dismiss this part of the subject without speaking of the peculiar aspect of the chest of habitually asthmatic persons. In natural respiration, the motions of the ribs are threefold, each towards the one above it, all the lower towards the upper, and all collectively towards the head. In asthma, the last is the only one, and is strong, of course to compensate for the want of the other two; hence the high shoulders, and *apparently* sunken chin.

With respect to alterations in the aspect and sensible properties of the belly, and organs connected with it, the gullet may be the seat of a stricture, either permanent or spasmodic (to be ascertained in general by the probang), or may contain polypi, which are usually situated at its upper part, as a scirrhus is at its lower. It may be obstructed also by various tumours of the neighbouring parts. The abdomen may present swellings, either *local*—as hypertrophy, and other enlargements of the spleen—or from temporary engorgement in the cold stage of intermittent fever, in hepatitis, and its consequence scirrhus of the

pylorus, intestinal calculi, umbilical or ventral hernia, cystitis, hysteritis, hydrometra, physometra, ovarian dropsy, extra-uterine conception; or more or less *general*, as from intestinal worms, in ascites and tympanitis, in the former of which it is flaccid and gravitating, producing, when struck, a sensible fluctuation, while in the latter it is elastic and uniform in its seat, and when struck emits a hollow sound. Lastly, the abdomen may be either knotted, as in common colic, drawn towards the spine, as in colica pictonum, or uniform, hard, and tense, as in tetanus, the effect in all these instances of the spasmodic contraction of the abdominal muscles. The rectum, like the gullet, may be the seat of stricture, either permanent or spasmodic, or may contain polypi; all which affections are to be ascertained either with the finger or a bougie. Of the alterations in the aspect and sensible properties of the organs subservient to urination and generation, and the neighbouring parts, very little will require to be said, since the origin of each, from the disease from which they arise, is in general sufficiently obvious. Thus, a tumour in or about the groin attends an inguinal, a ventro-inguinal, or a crural hernia, as well as a cystocele and several other diseases, as a bubo, a collection of hydatids, and so forth. This tumour, if the cause be a hernia, is increased by coughing, because, as this action is affected almost exclusively by the abdominal muscles, the cavity of the belly is thereby diminished, and a greater proportion of its contents therefore excluded. The seat of the tumour, and the method of reducing it, is of course various with each species of hernia. The reason also that the tumour in a cystocele is diminished by making water, is sufficiently

apparent. The consideration of the peculiar marks of tumours of the groin from other causes belongs rather to the business of diagnosis, than to that with which we are now engaged, the rationale of each being in general quite manifest. In the urethra, the phenomenon of a stricture, whether permanent or spasmodic, or of polypous concretions, is to be ascertained by the bougie. A tumour of the scrotum attends an hypertrophy or scirrhus of the organ, and a variocele, as well as numerous other diseases of its contents, such as a simple orchitis, or a tuberculated, encephaloid, or scirrhous condition of the testicle, and lastly, a scrotal or inguinal hernia, a collection of water or blood in the tunica vaginalis, or contiguous cellular tissue. The immense size which an hypertrophied scrotum sometimes attains has been already mentioned. The causes of the peculiar character of each of the other tumours are obvious. The reason that in scrotal hernia, unless when of immense size, the testicle may generally be felt at the upper and back part of the tumour, whereas in a congenital it cannot, is that in the former the prolapsed viscera are situated in a proper sac, which descends before the tunica vaginalis, whereas in the latter they are enclosed within the tunica vaginalis, and therefore necessarily envelope the testicle. The tumour, although in general transparent in hydrocele, is sometimes as opaque as in hematocele, the deposited water being in this, as well as in all other dropsies, sometimes any thing but pure. Of the obvious symptoms produced by scirrhus of the penis, phimosis, paraphymosis, chordee, &c. it is unnecessary to speak particularly. It has been elsewhere remarked, that chordee seems to arise

from an indurated state of the corpus spongiosum urethræ, and not from a preternatural contraction, as has been said of the so-called erectores penis, the effect of which seems to be priapism: they probably do really erect, and not depress, the penis, as has been recently supposed. Priapism has been noticed by Serres, Elliotson, Larry, and many others, as a common attendant on inflammation of the cerebellum; a fact which goes to support Gall's view of the residence in this organ of concupiscence. The passion thus in excess (conveyed by the respiratory nerves) becomes a stimulus to the necessary muscles, and priapism is the result. A tumour of the perinæum (still more evident however by the anus) is a necessary attendant on hypertrophy of the prostate gland, which further gives rise to great difficulty in passing a bougie or catheter into the bladder; and the reason that a larger instrument than ordinary is required in these cases is, that the neck of the bladder is made to recede, by the enlarged state of the gland, from the symphysis pubis. A calculus of the bladder is to be ascertained by the sound produced by striking it with a metallic instrument introduced by the urethra, which, if otherwise obscure, may be rendered more evident (it is said) by means of the stethescope applied over the symphysis pubis. With respect to the female organs, manifest changes in the aspect of the parts attends a hypertrophy of the labia, &c., prolapse of either the vagina or uterus, as well as sometimes a polypus, or an inversion of the latter, which, even when it does not protrude beyond the external aperture, is easily recognisable to the finger; and the reason that, in a polypus, the neck of the

tumour may be felt encircled by the os tincæ, which is not the case in an inversion, is sufficiently apparent. A scirrhous state of the os tincæ may generally be ascertained by the finger; in some cases the speculum uteri, a thin tube, somewhat conical, calculated to hold open the vagina while the light is directed on the os tincæ, may be advantageously employed. A dioptra, for the purpose of ascertaining the state of the os tincæ, is mentioned by Paul of Ægina; but the instrument commonly used for this purpose in modern times is the invention of M. Recamier. In retroversion of the uterus, the cause of the tumour, apparent both by the perinæum and by the rectum, is abundantly obvious, as well as of the difficulty or impossibility of passing a catheter into the bladder, since the neck of this organ is now firmly compressed between the symphysis pubis and the tilted-up neck of the uterus. Discharges occur by the urethra and vagina, of mucilage, blood, and pus. With respect to the alteration in their aspect which the several organs of the senses undergo from disease,—the nostrils may be preternaturally narrow, as in the last stage of typhus fever, in hemiplegia, apoplexy, and syncope, owing to the diminished action of the levator labii nasalis, so that the natural elasticity of the cartilages tending to close them is not sufficiently counteracted, or they may be preternaturally opened, as in all diseases of high excitement, as well as in tetanus, from the increased action of this muscle. This pinched appearance of the nostrils in depressing emotions, and dilated appearance in such as are exhilarating, is in some persons very remarkable; the latter, in particular, when a man thinks he

has said a good thing and looks for applause. The same thing also occurs in every considerable difficulty of breathing, and from the same cause, the muscle being excited in this instance, not for the purpose of allowing a man free ingress of air by the nostrils, but owing to the sympathetic irritation conveyed by the portia dura. The nostrils also may be impeded by tumours, as polypi or scirrhus, to say nothing of the preternatural flow from them of mucilage, as in catarrh—of blood, as in epistaxis—or of pus, as in ozæna. With respect to the eyelids, they may be either insufficiently opened during the waking hours, as in the disease called ptosis, or palsy of the levator palpebræ superioris; this is noticed also in some passions, as lasciviousness: or insufficiently closed during sleep, so that a portion of the white of the eye is seen between them, as in the last stage of typhus, in hemiplegia, and apoplexy, owing to a partial palsy of the orbicularis palpebrarum.

It is commonly combined in these cases with the pinched appearance of the nostrils just mentioned, and constitutes one of the most striking features of the Hippocratic countenance. But it is not only in diseases of minor action that the eyelids are either closed when they ought to be opened, or opened when they ought to be closed, the same not unfrequently occurring in the precisely opposite state of tetanus (when it has reached the portia dura); a circumstance easily enough explained, if we keep in mind that the opening and shutting of the eyelid depend upon the alternate action, during waking and sleep, of the levator palpebræ and orbicularis, and consequently, when both act together, as in tetanus, the eyelids

are deficiently opened in the waking hours, and deficiently closed during sleep: in other words, the too great contraction in tetanus of the orbicularis palpebræ may produce the same symptoms as the too little contraction of the levator palpebræ in ptosis; and too great contraction of the levator palpebræ in tetanus, the same symptoms as the too little contraction of the orbicularis palpebrarum in diseases of excessive debility. The eyebrows also may be fallen, as in hemiplegia and apoplexy, or raised, as in the advanced stage of tetanus, the former from the too little action, the latter from the too great action, of the occipito frontalis. Lastly, the eyeball may be immoveable, either in hemiplegia or apoplexy, on the one hand from palsy of the muscles which move it, or in the advanced stage of tetanus, on the other from a general spasm of these muscles (supplied by the third, sixth, and fourth pairs of nerves). The axis of the eyeballs also may converge inadequately, so as to produce double vision (but not a squint), as occurs in idiotism, from the stimulus of the will being insufficient; or they may be so far distorted as to produce palpable squinting, as occurs in myelitis of the upper part of the spinal marrow in the second stage of hydrocephalus, and in tetanus previously to the eyeball being entirely fixed, owing probably in all these cases to the irritation at the origin or in the course of the fifth and sixth pairs of nerves, producing contraction of all the muscles of the eyeball with the exception of the superior oblique, which is supplied by the fourth pair (the origin of which is out of the way of such irritation), consequently each eyeball is turned upwards and inwards from the inferior oblique not being anta-

gonized. The same effect also takes place in some degree (as has been elsewhere observed), not when the other muscles act *too much*, but when the superior oblique acts too little, as in depressing emotions, syncope, &c. In all these cases, some rigidity is commonly perceived at the same time in the lower jaw, for a reason which will be immediately given. Some degree of squinting is *in general* observed, likewise (according to Richter), always in amaurosis of one eye, owing to the blind eye not moving with the other, from defect of sympathy. The eyeballs also may be either preternaturally moistened with sebaceous fluid, as in ophthalmia tarsi; with tears, as in fistula lachrymalis; or with pus, as in purulent ophthalmia; or they may be unusually dry, as in the first stage of fever, owing to the constriction of the capillary arteries of the lachrymal gland. The eyeball also may be at one time bright and shining, as in the second stage of fever, owing to the dilatation of its vessels permitting a more copious ingress into them of colourless blood, by which the rays of light are reflected; or they may be at other times dull and pearly, as in the hectic habit, owing to many of these vessels having become impervious. The former of these states is commonly conjoined with blushing, and the latter with paleness, for an obvious reason. Lastly, the eyeball may be either red, as in ophthalmia membranarum, or yellow, as in jaundice. With respect to the iris, its circle may be either preternaturally broad, so as to produce a diminished pupil, as in ophthalmia membranarum, iritis, nyctitis, arachnitis, and nyctalopia; or preternaturally narrow, so as to produce an enlarged pupil, as in tabes mesenterica, intestinal worms, encephalitis,

hæmeralopia, epilepsy, hysteria, &c.; the cause being in the former case a state analogous to erection, owing to the increase of the accustomed stimulus, from the increased sensibility of the retina, and in the latter from a precisely opposite state, from the diminished sensibility of the retina. A contracted pupil is the worst possible symptom in apoplexy (Cooke and Blane, &c.), as shewing a state analogous to the second stage of hydrocephalus, from which recovery is impossible, *i. e.* when secondary arachnitis has set in. In addition to these alterations in the aspect of the eyes and their appendages, most of the organic diseases of the eyes are sufficiently evident to the sight.* From the ears likewise there is, after otitis,

* We may here notice the very ingenious optical test of cataract lately proposed by Sanson.

When a candle is held before a sound or an amaurotic eye with a dilated pupil, three distinct images of the candle are perceived; the first anterior, distinct, and upright; the second deeper, paler, and upright likewise; and the third reversed, situated between the other two. The third is paler than the first, but brighter than the second, and the smallest of all. The characteristic peculiarity of the third, and what renders it easily distinguished, is, that it always moves in an opposite direction from the other two when the position of the candle is changed.

In every stage of development of cataract these images are wanting.

Opacity of the cornea destroys the three images; opacity of the anterior capsule of lens, two; and opacity of posterior capsule, one.

If the capsule and lens are removed, one image only will be produced; if only the lens be removed, the first anterior image and the reversed will be formed. In every stage of development of opacity of capsule, the reversed image is wanting.

When fluid exists between the lens and capsule, as in the ox, five images are seen, three upright and two reversed. (Des leçons les maladies des yeux, faites par M. Sanson, et publiés par M. Ebrard.)] —Editors.

or suppuration of the arachnoid coat, a discharge of purulent matter. With respect to alteration from disease in the aspect of parts of the mouth, the lips may be drawn to one side, as in hemiplegia, owing to a palsy of the muscles of the opposite side; or they may be pendulous, from a palsy of the orbicularis oris; the mouth also may be permanently open, from a palsy of the temporal and masseter muscles (attended of course with a collapse of the temples, another characteristic of the Hippocratic countenance), as in the last stage of typhus fever, apoplexy, &c. On the contrary, the lips may be contracted and drawn towards the ears, and the jaw permanently fixed, from directly opposite causes, as in tetanus. The fixing of the jaws commonly precedes the sardonic grin in this disease, because the affection reaches the posterior part of the third branch of the trigeminic nerve, by which the muscles of the jaw are supplied before the portio dura, which is distributed on those of the lips.*

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* According to a late renowned nosologist, this depends upon the connection of the trigemini with the upper extremity of the ganglionic system of nerves, by which he represents the stomach (the common origin of this disease) as supplied; which connexion he was lucky enough to have discovered in "ripping" the nervous ramifications. To say nothing, however, of the equal distribution of this system to many other parts, and of the almost equally direct communication of almost every member of the body with the said system, it had evidently never entered into his contemplation, in the progress of his "ripping," to consider the distinct functions of the several parts of the nervous system, that the ganglionic gives only a susceptibility of irritation, and cannot possibly communicate a stimulus; and that it is at most only *one* branch of the trigemini which can communicate motion when stimulated, and that one is

The grinding of the teeth also in intestinal worms seems to be occasioned by a kind of convulsions of the pterygoid muscles through the medium of the third branch of the fifth pair of nerves, excited in a similar manner by sympathy with the primary seat of irritation. In hemiplegia, the tongue, upon being protruded from the mouth, is drawn, not, like the lips, towards the sound side, but towards the affected side, because the sound genio-glossus will of course pull forwards a greater portion of one side than its palsied fellow can of the other; so that the whole organ is turned as it were upon a pivot. It is for a similar reason also that the whole head is drawn towards the same side in hemiplegia, because the action of the sound sterno-cleido-mastoid will of course more than antagonize that of the palsied one.

All these parts, lips, jaws, and tongue, as well as features in general, are variously distorted in myelitis of the upper part of the spinal marrow, in the second stage of hydrocephalus, epilepsy, hysteria, and chorea, as will be more fully considered in future. The tongue, moreover, may be either preternaturally dry, as in synochal fever, from the general diminution of the secretions, or moist and clammy, as in cynanche tonsillaris, from the secretions of the tonsils being increased. It may be also not only dry, but redder than ordinary (either generally, or at its edge and pa-

not very directly connected with the ganglionic system. The profound author, like many others (in whom, however, the oversight is much more pardonable), has been quite satisfied in this, as in the few other instances in which he has attempted any thing like a rational explanation when he could possibly stumble upon any kind of connection of any kind of nervous filaments.

pillæ only), as in hectic fever, owing to its secretions being habitually diminished; or it may be of a gray or white colour, as in dyspepsia, from these secretions, like those of the stomach, being vitiated. In hectic fever, as well as in most diseases of excitement, it is more elongated and pointed than natural, from the too great action of its muscles; while in dyspepsia, on the contrary, and most diseases of debility, it is commonly flat and broad, for the opposite reason. In the last stages of typhus fever, the tongue is coated with mucilage, so corrupted as to have lost all its natural character, becoming solid and black. Lastly, in jaundice, the tongue is coloured, for the same reason as the skin; in glossitis enormously swelled. The odour of the halitus of the mouth may be offensive from various causes, as in the last stage of typhus, intestinal worms, ptyalism from mercury, scrobutus, caries of the teeth, scarlatina maligna, dyspepsia, and insanity; this last very remarkable, and noticed by Aretæus and Cælius. With respect to the common integuments, the last organ immediately subservient to the five proper senses, the surface of the body generally, or particularly, may be either preternaturally tumid, as in polysarcia, anasarca, phlegmasia dolens, elephantiasis, Barbadoes leg, and pneumatosis; or emaciated, as in morbus cæruleus, tabes mesenterica, worms, and the hectic habit. This emaciation arises in morbus cæruleus from bad blood, in tabes mesenterica from a deficient supply of that fluid; in worms it is less real than apparent. The emaciation in hectic habit is sufficiently explained by the circumstance, that each attack is attended with increased secretion. The integuments, further, may be tightly bound down to

the muscles, as in sclerema, from the induration of the subcutaneous cellular tissue.*

The skin, moreover, without being shrivelled, is constricted, dry, and pale, in the first stage of fever, in dropsy, diabetes, and asthma, arising from a constricted state of its capillary arteries, such as always attends the first stage of fever; and in dropsy and diabetes is attributable to the same cause as the diminution of the secretions in general, which always attends these diseases, namely, the diminished sympathetic irritation with the organ formerly affected; while in asthma it seems to arise from the internal circulation, which, as has been often before observed, always attends a preponderance of the inspirations over the expirations. The suppression of the secretions in general from dropsy and diabetes is merely the converse of vicarious secretion. The turgid and flushed appearance of the skin, on the contrary, in the second stage of fever, arises from a dilated state of these arteries, such as always attends this stage. It is turgid and purple in all diseases of lungs and heart, from impeded circulation of the venous blood, and *a fortiori*, therefore, in morbus cæruleus and asphyxia. The colour of the integuments also may be either yellow, as in the jaundice and yellow fever, from al-

* [In the cellular tissue of hide-bound (zellgewebsverhärtung) children, the fat is found to be changed in its nature, the fat cells are no longer smooth, but rather of a granular texture; and in the severer forms of this disease, no fat globules can be pressed from them, so that here a structural change, or rather a congelation (errstarrung), of the fat in the cells has manifestly occurred. (Gluge, op. cit.)

This disease Gluge believes to be produced by the operation of cold, to which new-born infants are extremely susceptible.]—EDITORS.

teration of the sebaceous matter (Ford), from bile (Bancroft), or from blood (Desmoulins); of a greenish cast in that form of dyspepsia called chlorosis, from vitiated sebaceous matter; pallid, as in painter's colic and anæmia, from the decomposition of the red particles of blood; or deadly pale, as in syncope, from the arteries being empty. The skin, also, like the mouth, may give off an offensive halitus, from various causes, or be covered with spots and patches of various kinds, as in the several diseases of the skin. Of these and their respective terminations it is unnecessary to speak particularly; but we cannot dismiss this subject without again adverting to the immense variety of inflammations, all called erythematic, to which the same tissue, the dermoid, is thus obviously liable, each as distinct from the rest as that of a different tissue could possibly be,—this is perhaps the same in every other tissue of the body,—and gastro-enteritis is therefore probably totally different at different times; and hence the great differences of the diseases to which it appears to give rise.

Lastly, the state of the nails and hairs, independently of their proper diseases, is frequently symptomatic of diseases, both being thin, and the former remarkably curved, in hectic fever, owing apparently to deficient nutrition, corresponding to the defective secretion of mucus of the mouth, &c.; and both growing with inordinate rapidity, on the contrary, in all diseases attended with increased secretion, particularly during convalescence from fever, or even after an ordinary debauch. This every body must have noticed, and the cause is sufficiently palpable. The changes in the aspect and sensible properties of the ver-

tebral column and skull from diseases are not very numerous. The former may present local tumours, as occurring in hydrorachitis, or may be variously distorted, as occurs in rachitis and tubercular abscess of the bodies of the vertebræ. In hydrorachitis the tumour, produced as it is by water contained in either the sac of the arachnoid or the contiguous cellular tissue (which has occasioned the absorption of one or more of the spinous processes, generally of the lumbar vertebræ), is of course soft and compressible, and generally less obvious in the horizontal than in the erect position. The reason of this is sufficiently clear.*

In rachitis, the distortion of the spine is generally from side to side, whereas in abscess of the bodies of the vertebræ it is from before to behind; and this will be easily understood, if we reflect that in the former, all the parts of the vertebræ are equally affected, so that they give way in the direction which we commonly give to the spinal column when standing at ease, that is, a lateral curve; whereas in the latter, which affects exclusively their bodies, this lateral curve has less effect in producing permanent distortion, than the natural tendency of the spinal column to fall forward, which acts directly upon their

* A late great nosologist describes the water in this disease "as working its way (to use his own words) from the brain down towards the foramen *ovale*, the surrounding dura mater *giving way*, and winding itself through an *accidental* opening between the vertebræ." The only objection to this lucid itinerary is, that it is too palpably borrowed, either from the Syrens in Terence's play of the Adelphi, or from Lancelot Gobbo in the Merchant of Venice. "Turn up on your right hand at the next turning, but, at the next turning of all, on your left; marry, at the very next turning, turn of no hand, but turn in directly to the Jew's house."

bodies. In rachitis, moreover, there are generally two such lateral distortions, the second produced by the contractions of the muscles necessary to counteract the tendency of the body to fall on one side, produced by the first, till, the second being established, and the centre of gravity of the body being thus rendered proportionate to its base, these constant contractions are no longer necessary. It is hardly necessary to say, that the more acute the angle at which the spine is distorted, whether in rachitis or abscess, the greater the mischief; and hence it is much better to have two vertebræ out of their place than one, and three than two. The skull, also, like the spine, may present local tumours, as in encephalocele, or a general enlargement, as in some cases of hydrocephalus, and in rachitis. It remains now only to say a few words concerning the altered appearance from diseases of the organs of voluntary motion. The joints, larger or smaller, may be red and tumid, as in rheumatism or gout, or tumid and hard, but without redness, as in white swelling, or tumid and soft, but equally without redness, as in hydrarthus; or they may be the seat of hard knots, as from the deposition of calculi within the bursæ, or of soft tumours, as in hygroma; lastly, they may be wholy immoveable, as in anchylosis, or variously distorted, as in dislocations. The rationale of all this is abundantly apparent. The limbs in general may be the seat of hard tumours, more or less general, as in hyperostosis and exostosis, or bent, as from rachitis, or variously distorted, as after a fracture; or they may be spasmodically contracted, as in tetanus and raphania, or convulsed, as in epilepsy, hysteria, and chorea, or pre-

ternaturally flat and flaccid, as in palsy. The want of power to use them, attendant upon this disease, belongs to another head. The flatness and flaccidity seem to be the effect of the want of permanent contraction which is natural to healthy muscle, and which gives the limb the tumid and tense appearance which is indicative of high health.

CHAP. III.

RESPIRATION.

ACCELERATED AND RETARDED RESPIRATION—IMPERFECT CONVEYANCE OF STIMULI TO RESPIRATION—ASTHMA—OPINIONS REGARDING ASTHMA—ANGINA PECTORIS—IMPEDIMENT OF THE AIR-PASSAGES—CAUSES OF ASPHYXIA—SNORING, SIGHING, GROANING, &c. —COUGHING.

We proceed now to speak of the alterations produced by disease in the various processes by which the several functions are performed; the alterations in the mere aspect and sensible properties of the respective parts of the body which are subservient to these functions having been sufficiently insisted on.

To begin with *respiration*. The action of the respiratory muscles may be either in too quick or too slow succession,—the former occurs in fever, the latter in syncope,—too weak, as in asthma, too strong, as in angina pectoris, or too short, as in peripneumonia, or too deep, as in apoplexy, or too sudden or too deliberate, or it may be attended with difficulty, or with various preternatural phenomena. Each of these states must be referred to some fault of either the *irritability* of the muscles immediately subservient to this function, the *stimulus* by which this irritability is excited, the *conveyance* of this stimulus by the respiratory nerves, the *mechanism* of the organs to be

moved, or, lastly, the *passages* and cells into which the air is received. Nothing need be said of the air itself, since any vitiation of this operates in producing difficulty of breathing only, either by affording an insufficient stimulus, or by obstructing the air-passages. Now, that any primary change in the irritability of the respiratory muscles is ever a cause of perturbed respiration, is unsupported by any argument; so that the other causes alone, viz. changes with regard to the primary stimulus, the conveyance of this stimulus, the mechanism of the parts, and the receptacles for the air, alone remain to be considered. The most common, and perhaps the only direct, cause of accelerated or retarded respiration, seems to be some peculiarity in the usual stimuli to inspiration, which have been elsewhere assumed to be, on the one hand, an accumulation of venous blood in the pulmonary arteries, and on the other, a permanent stimulus derived from the brain; so that any excess or deficiency of either of these will necessarily call the muscles either too rapidly or too tardily into action. Now such an excess occurs with regard to the former of these, in either a preternaturally excited state of the heart on the one hand, by which more venous blood is transmitted in a given time from the right side of it, or from a deficiently excited state of the heart, and a contracted state of the left cavity, on the other, by which the blood of the pulmonary veins being less easily passed forwards, the blood in the pulmonary arteries is necessarily accumulated. In the former case the lungs receive too much, in the latter they return too little; and it is upon one or other of these principles that we must explain the hurried respira-

tion (with a preponderance of expirations) which occurs in the second stage of fevers, as well as after violent exercise, &c. and the equally hurried and still more oppressed respiration (with a preponderance of inspirations, and frequent involuntary sighing and gaping) which occurs in the first stage of fevers, as well as in carditis of the left cavity of the heart, in rheumatism of this organ, in hypertrophy of the left ventricle, combined with either a diminished size of the cavity, or aneurism, in aneurism of the arch of the aorta, in morbus cæruleus from stricture of the apertures of the left side of the heart, or from a preternatural communication between the two sides (which, during exercise or emotion, always overloads the left), in ossification of the valves in the left side of the heart, and in dropsy of the pericardium; in all which, either the cavity of the left side of the heart is diminished, or a preternatural quantity of blood is already there collected. Difficulty of breathing is greatest in diseases of the left heart, turgescence of venous system in diseases of the right. It is during inspiration that the blood passes most easily *into* the lungs, and during expiration, *out of* them; but under excitement, too much is already passing in, and the thing wanted is to send it forwards, therefore the expirations preponderate; whereas in depression, and in diseases of the left heart, not too much is passing in, but too little is passing out, owing to an engorgement of the left side of the heart, which is relieved by accommodating more in the lungs, therefore the inspirations preponderate; and this is the reason why we sigh and gape under all these circumstances, by which the energy of the heart is diminished, and its left

cavity overloaded. This primary stimulus of inspiration, moreover, is irregular in palpitation of the heart, and defective in syncope; and hence the irregular respiration which generally attends the one, and the tardy respiration, and even asphyxia, which, when the syncope is perfect, always supervenes on the other. Whether the second natural stimulus to inspiration (viz. that derived from the brain), either when excessive, irregular, or defective, operates *directly* upon the respiratory muscles, or through the medium of the heart alone, is questionable. The latter, however, is most probably the case, and therefore the cause of too rapid or too slow respiration is really resolvable into its action upon the heart. The stimulus to expiration is seldom either excessive or irregular, but it is often defective, as in that kind of asphyxia which results from inhalation of inert gases. With respect to perturbed respiration, resulting from the inadequate conveyance of this primary stimulus to the inspiratory muscles, which we have presumed to be effected by that system of nerves called respiratory, it is probable that is the cause of the weakness of breathing which frequently attends a curvature of the spinal column, from rachitis, or a tubercular abscess in the cervical or dorsal vertebræ, and this independent of any impediment to the mechanism of the parts, owing to pressure upon the respiratory column of the spinal marrow, as well as in myelitis, owing to interstitial deposition within these columns, and probably also in asthma, owing to generally, perhaps, functional, but sometimes organic, defect in some part of the system of nerves in question. Thus far at least we know, that any

one of the diseases just mentioned frequently gives rise to phenomena similar to those of asthma, and that a division or other injury of the par vagum is always attended with the same effect; and there appears, both from this consideration and many others, particularly the beneficial effects of galvanism in asthma, good reason for believing that this disease, as supposed by W. Philip, is allied rather to palsy than to spasm, and that it stands in this respect, to the respiratory muscles, almost in the same relation as dyspepsia to those of the stomach, a disease occasioned by a division of the par vagum, and relieved by galvanism almost in the same way as asthma. With respect to asthma, it has almost universally been considered a spasmodic disease, though doctors have strangely differed with regard to the seat of the assumed spasm. By Mayow, the first distinctly to show the true action of the diaphragm and intercostal muscles in respiration, it was supposed to be situated in the former of these; and by Willis it was referred to the muscular coat of the bronchia (Cullen, Laennec, and Forbes), a little before described by Malpighi; while by Monro and others it has been imagined to have its seat in the arytenoid muscles; so that, according to the first opinion, expiration is impeded, and according to the two last, inspiration. But a spasm of the diaphragm probably (as we shall endeavour to show in future) produces angina pectoris, and a spasm of the arytenoid muscles produces certainly asphyxia, while the doctrine of a spasm of the muscular coat of the bronchia assumes, first, that they have a muscular coat, which is somewhat questionable; 2d. that such mucular coat, admitting it to exist, is liable to

spasm, which, from its strict analogy with the muscular coat of the ducts of the several conglomerate glands (which are perhaps never so affected, not even the gall-ducts), is very improbable; and, 3dly. that such a spasm, admitting it to occur, would occasion the phenomena of asthma, which is next to impossible. That it may exist, says a learned nosologist, no one has been bold enough to deny, and that when it does exist, it must produce asthma, can be as little doubted; but it may be reasonably asked, on the one hand, whether a spasm of these tubes would necessarily produce a constriction of them, which is certainly not always the case in other parts (gastrodynia, colic, &c.); and, admitting that it might do so, whether tubercles, pulmonary apoplexy, or œdema of the lungs, and so forth, which, so far as constriction is concerned, are equivalent to a spasm, ever produce any phenomena similar to those of asthma; whether such phenomena would be excited, like dyspepsia (which is probably a strictly analogous disease, and which has never been considered as spasmodic), by compressing the spinal column, or by diseases of the proper respiratory nerves; whether these phenomena, presuming them to arise from such a spasm, would occur by night, when there are so few irritating causes, rather than by day, when there are so many; whether they would be susceptible of relief from assuming the erect posture, or from the efforts of the patient; whether they would be alleviated, and not rather increased, by the inhalation of oxygen, and by galvanizing the chest; and, lastly, whether they would not be attended with cough from the beginning, and with acute pain when each particular bronchus had got the cramp.

Every fact relating to asthma seems to indicate, not increased, but diminished action, and that not of the muscular coat of the bronchia, but of the respiratory muscles in general; and to show that it is to these muscles what palsy is to the voluntary muscles, syncope to the heart, and dyspepsia to the stomach.

The assumption that paroxysms of asthma, whatever be their nature, are excited by morbid secretions in the bronchia, such as have been described particularly by Dr Bree, or by accumulations of air either in the cellular tissue or air-cells of the lungs, such as was described, the former by Watson, the latter by Baillie and Laennec, is a pretty evident mistake of effects for causes; and the circumstance particularly noticed lately by Rostan, Paschal, Dr Adams, and others, that in asthma there are frequently again diseases of the heart or other viscera, seems to be no less accidental than that such diseases are often found in persons liable to angina pectoris, and many other affections apparently but little connected with them.

The same inadequate conveyance of the primary stimulus to respiration seems to be the cause of that form of asphyxia which succeeds apoplexy, whether sanguineous or nervous,—the pressure on the brain in the former case, and the functional derangement of this organ in the latter, being ultimately extended to the respiratory system; and hence it is well known that these affections are always dangerous in proportion as the lesion approaches the tuber annulare. Another consideration is, that division of the par vagum produces bronchitis, emphysema, &c. on the one hand (the former constant, the latter frequent, in asthma), and on the other, inflammation of the sto-

mach, both referrible to impeded function. The next cause of perturbed respiration which has been mentioned, is some fault in the mechanism of the chest, the stimulus to this function, and the conveyance of this stimulus, being both entire. This seems to take place in pleuritis, in adhesions of the pleura, in pneumatosis, in rheumatism of the intercostal muscles, in the distortion of the ribs arising from rachitis, and in fracture of the ribs; in all which inspiration (which is too short, and therefore in too rapid succession) is effected chiefly by the action of the diaphragm, as well as in inflammation of the spleen, liver, and peritoneum of the kidney and of the diaphragm, and probably in angina pectoris; in all which, with the exception of the last, it is likewise too short, and is effected chiefly by the action of the intercostal muscles, for reasons which must be sufficiently obvious. To the same defective mechanism also may be ascribed that form of asphyxia which results from a prolonged pertussis or angina pectoris; in the former of which inspiration, and in the latter expiration, becomes at length impossible. The last explanation proceeds upon the assumption that angina pectoris, as supposed by Dr Darwin, consists in a spasm of the diaphragm, which, from its obvious alliance with the troublesome sensation called stitch, with respect to its principal exciting causes, from the peculiar phenomena of the disease (acute pain, &c.), and from the remedies most effectual in relieving it, seems to be by far the most satisfactory of any of the numerous theories advanced with respect to its nature.

On this subject we have an amusing variety of opinion. One of the first advanced was, that it consisted

in a diminished action of the heart, *i. e.* a kind of syncope, arising from certain organic affections of this organ impeding its action, such as an abundance of fat, according to Fothergill; ossification of the coronary arteries, according to Black and Parry; of the semi-lunar valves at the mouth of the aorta, according to Wall; or of any part, according to Heberden; or, lastly, putridity of the heart, according to Johnstone. But that it is not syncope, and has not any affinity to syncope, seems evident from the different kinds of persons which it attacks, from the different causes by which it is commonly excited, and particularly, on the one hand, from the acute pain which attends it, and from the occasional length of the paroxysm, and, on the other, from its not necessarily alternating with palpitation of the heart, which is almost always the case when syncope arises from an organic disease, and from the perfect continuance, during the paroxysm, of sensibility and the power of voluntary motion, as well as of the natural pulse, and of the natural colour and temperature of the skin. If, moreover, the aforesaid morbid affections of the heart ever really produced angina pectoris, they should produce it more frequently than they are supposed to do; and if angina pectoris ever really arose from such affections, it should not so frequently occur without the least appearance of any one of them. It was the opinion of Hagarth, that angina pectoris proceeded from an affection of the mediastinum, preventing perhaps the free descent of the diaphragm; that of Brera, that it depended on an enlarged size of some of the viscera of the belly operating in a similar way; and that of Latham, that it arose from some

chea, the *bronchia* great or small, or the *air-cells*, being obstructed by pressure applied directly to their rough surface, the breathing is of course impeded. Lastly, the difficulty of breathing which exists in hydrothorax, in hæmothorax, pneumothorax, and empyema, as well as in asphyxia from any of these diseases, is referrible to the *bronchia* great or small, or the air-cells, being now obstructed by the pressure applied generally to the surface of the lungs.

Now, from all that has preceded, it will appear that asphyxia, or a total cessation of the function of respiration (not to repeat what has been said of all minor perturbations of this function), may result, 1st. from syncope; 2d. from inert gases; 3d. from apoplexy, whether sanguineous or nervous; 4th. from pertussis or angina pectoris; 5th. from various diseases of the lungs, stimulating gases, or drowning; 6th. from diseases of the trachea, or hanging; 7th. from various diseases of the lungs or heart; and, 8th. from various collections in the sac of the pleura. In the first and second of these cases it arises from a defective primary stimulus; in the third, from a defective conveyance of this stimulus; in the fourth, from a defective mechanism; and in all the rest, from an obstruction, internal or external, of the air-passages. In what particular manner the suspension of respiration extends its effects to the heart and brain, is not yet quite settled.

The conceit of Vesalius, that the chief use of respiration is to uncoil as it were the pulmonary vessels, and thus to allow the passage of the blood, no matter of what quality, from the right side of the heart to the left,—and that of Pechlin and his coadjutors, that if an animal had its foramen ovale opened, it might be

immersed in water or hanged with impunity,—are indeed obsolete. It is known that, though there is certainly some turgescence of the vena cava and right side of the heart, the heart beats for some time after the suspension of respiration, and that it beats on blood received from the lungs; but it is still a question whether this blood be black or red. The opinion that it is the former, which is that of Lower, Hunter, Goodwin, Beclard, Brodie, Bichat, and many others, is by far the more prevalent: they attribute asphyxia accordingly to the inadequacy of this black blood to support the action of the left heart. As, however, from any transitory impediment to respiration, it has never been suspected to be black blood which reaches the left heart, and in asphyxia the formation for some time of red blood may be easily explained; as it is quite inconsistent with analogy to suppose that the radicles of the pulmonary veins will admit, except in extremely small quantities, any other than red blood, and the emptiness of the arteries after death is best explained on their presumed incapacity to do so; as, after death from asphyxia, while the "système à sang noir" is commonly found gorged with black blood, the "système à sang rouge" is comparatively empty; as we know that asphyxia is often obviated, or at least retarded, by an open state of the foramen ovale and ductus arteriosus; and as it has been established that black blood, if it *did* reach the left heart, would be adequate, both as poured into its cavity, to stimulate it to contraction, and as received with the coronary arteries, to keep up its irritability for a much longer time than it takes to produce asphyxia, contrary to the opinion respectively of Good-

win and Bichat; the opinion that, so long as the left side of the heart contracts at all, it contracts almost exclusively upon red blood, and that when it ceases to contract, it does so, not because it receives black blood, but because it receives no blood at all, which is that of Dr Williams of Liverpool, Dr Philip Kay, and some other recent physiologists, is probably the true one. In the same way, the functions of the brain and other organs are suspended, not from receiving vitiated blood, but from receiving no blood at all.

Connected with the function of respiration, are various morbid phenomena, which consequently fall to be considered in this place; such as snoring, sighing, gaping, hiccoughing, and whooping, all which are effected generally during inspiration; and sneezing, groaning, shrieking, sobbing, laughing, and coughing, all which, on the contrary, are effected during expiration. In some instances, incapacity to snuff suddenly up the nostrils, is indicative of disease, as in acute laryngitis, of which, according to Marshall Hall, this incapacity is a pathognomonic symptom. It arises from a tenderness of the vocal chords not admitting of a sudden and violent transmission of the air, such as takes place in snuffing through the rima glottidis. The manner in which all the actions just enumerated are performed has been already considered elsewhere, so that it remains only to mention here a few diseases of which each is symptomatic. Snoring, it is well known, is a common symptom of sanguineous apoplexy, and arises obviously from a palsy of those muscles which should elevate the palate; and it has nothing to do either with the nostrils or the trachea. Sighing is a common symptom of the

first stage of all fevers, particularly, it is said, of that which precedes the miliary eruption, as well as of all diseases of the lungs and heart, and arises in all these cases from the preternatural accumulation of blood which takes place in the system of the vena cava, which is relieved by thus accommodating a greater portion of blood in the lungs, the blood reaching the latter the more copiously the deeper the inspiration. It is indicative also of all diseases of oppression, from the same cause. Yawning has already been represented as little more than a convulsive sigh, and it takes place therefore in all diseases of which sighing is symptomatic, as well as of inflammation of the diaphragm, the organ chiefly engaged in this process. In this case it is effected, not for the purpose of relieving the heart, but owing to the direct irritation of the diaphragm, which calls it into inordinate contractions. Hiccoughing is also a common symptom of chronic inflammation of the diaphragm, particularly upon any thing hot being taken into the stomach. It likewise often occurs in scirrhus of the cardia, in hepatitis, and in dyspepsia, probably owing to the irritation of this organ by the tumid organs in its neighbourhood. Whooping is almost distinctive of pertussis, and arises partly from a constricted state of the rima glottidis (owing probably to a transitory tumid state of the vocal chords), and partly from the necessity of a rapid supply of air consequent on the exhaustion of the lungs by a paroxysm of coughing. Laennec attributes this symptom of pertussis to a spasmodic constriction of the bronchia, a state which, even admitting its existence, could never produce a whoop. Of the morbid phe-

nomena attending expiration, sneezing, as is well known, is a common symptom of incipient catarrh, and arises apparently from a preternatural tenderness of the schneiderian membrane, owing to a deficiency of its proper mucilage. In this sneezing is analogous to the sensation of heat excited by the tears in the beginning of ophthalmia, and to the ardor urinæ in the beginning of gonorrhœa. There is no increase of sensibility in any of these instances, but only deficient protection. Groaning has been already described as dependent upon the passage of the air, during expiration, over the vocal chords, rendered tense by the contractions of the thyro-arytenoid muscles; and from this, screaming differs only from the rima glottidis being at the same time constricted by the contraction of the proper arytenoid muscles. The former is indicative of considerable, and the latter of excessive agony, although it does not always arise from this cause; the screaming in hydrocephalus, for example, of which the patient is frequently quite unconscious, clearly arising from a spasm of these muscles, excited by the irritation of the nerves which supply them. With respect to sobbing and laughing, which, as symptomatic of disease, occur principally in hysteria, they seem to depend upon a convulsive action at once of the muscles of the larynx and of the respiratory muscles, which action is, like the screaming in hydrocephalus, perfectly independent of the emotions by which these actions are ordinarily excited, and arise equally from some inordinate irritation in the nervous system. It is very difficult to divest the mind of the idea, that, as when a person screams he is in great agony, so, when he sobs or laughs, he is actuated by

sorrow or mirth; but it is easy to conceive, what is certainly the case, that those actions which are commonly excited only by such emotions, may in disease be excited by many other causes. No one ever considers a man whose mouth is stretched from ear to ear in tetanus as actuated by any extraordinary mirth; but it would be just as reasonable to do so, as to regard the scream of a hydrocephalic child, or the laugh or sob of an hysteric woman, as indicative of mental emotions.

A cough, the rationale of which has been given elsewhere, is symptomatic of any irritation of the larynx, whether direct or sympathetic; which irritation generally displays itself in the part by a sensation very analogous to formication (which will be spoken of under the head of uneasy sensations), in relieving which the cough seems to be instrumental almost in the same way as friction removes formication or itching from the surface of the body. The relief however is only momentary, unless the primary irritation be at the same time removed; and hence the unsatisfactory nature of a dry cough compared to one by which any thing is excreted. Coughing is a common symptom, not only of laryngitis, in which the irritation is *direct*, but also of cynanche trachealis, bronchitis, peripneumonia, pleuritis and adhesions of the pleura, tubercles of the lungs, œdema of the lungs, bronchial calculi, hæmoptysis, emphysema of the lungs, ulceration of the larynx, abscess of the lungs, pertussis, and many other affections of distant parts, in all which the irritation is sympathetic; the cough, however, taking a different character in each with respect to its frequency, its violence, and the sparing or copi-

ous, thick or thin, mucilaginous, membranous, calcareous, bloody, or purulent appearance of the matters expectorated. Indeed (with the exception of the heart and stomach) there is perhaps no organ which so strikingly sympathizes in diseases with distant parts, and hence a cough is a very common symptom of various diseases. With respect to the nature of pertussis, it seems to be at first a strictly functional disease, and to consist essentially in a preternatural irritation of the larynx, recurring at intervals, analogous perhaps to formication, the cause of which, we shall in future endeavour to shew, is a transient accumulation of blood (to a less degree than constitutes inflammation) in the minute vessels of the parts affected. Thus is the cough produced. It commonly goes on, it is true, to bronchitis, and many other organic affections of the lungs (produced by the frequent and violent coughing); but in this respect it resembles asthma, which is at first unquestionably functional alone. In some instances the accumulation of mucilage in the bronchia does not excite cough, but merely a wheezing sound in expiration, a symptom frequently occurring towards the end of a paroxysm of asthma.

CHAP. IV.

AUSCULTATION* OF RESPIRATION.

AUSCULTATION OF THE VOICE—RESONANCE—CONSONANCE—VARIETIES OF THE VOICE HEARD IN THORAX—STRONG BRONCHOPHONY—PECTORILOQUY—WEAK BRONCHOPHONY—EGOPHONY—INDISTINCT BUZZING SOUNDS—VESICULAR RESPIRATION—BRONCHIAL RESPIRATION—RATTLES—VESICULAR RATTLE—CONSONANT RATTLE—DRY CREPITATING RATTLE—AMPHORIC RESPIRATION—METALLIC TINKLING—RUBBING OF PLEURA—CALORIFICATION—INCREASE OF HEAT—DIMINUTION OF HEAT.

The auscultatory phenomena of the respiratory organs may be divided into those of the voice, the sounds of respiration, and those produced by the rubbing of the pleura.

* [As those parts of the MSS. which treat of the auscultation of the lungs and heart contain nothing original of Dr Fletcher's, but merely a view of the principles of auscultation as laid down by Laennec, without reference to later improvements in that department of medical science, we have felt no scruples in substituting for them the following account of the subject, which is taken from one of the most recent practical works on auscultation, viz. that of Dr Skoda of Vienna (Abhandlung über Percussion und Auscultation. Wien. 1839), and contains in fact the substance of a paper which we inserted in the Edinburgh Medical and Surgical Journal, July 1841. The peculiarity of these views, and our reason for adopting them, are their simplicity, precision, and practical value.

Dr Skoda's views being based on experiment and observation alone, and his position affording the most abundant opportunities for their application, as well as his almost unrivalled skill as a practical auscultator, give greater weight to his opinions and observations than to any that have been published since the time of Laennec.]—EDITORS.

Auscultation of the voice.

On examining the chest of healthy persons, it will be found that the sound of the voice is heard to a certain degree, amounting to strong resonance in some parts of the chest, while in others it is either not heard at all, or merely as an indistinct humming or buzzing sound. The strength of the sound thus heard in healthy persons is greatest between the shoulder-blades and the spine, weaker under the clavicles, and still weaker in the axilla and over the rest of the chest; but it varies very much in intensity in different individuals. In disease it is so much modified, both in intensity and in the parts of the chest where it is heard, that many important indications may be derived from the varieties which it assumes.

Before considering the different kinds of resonance in detail, it is necessary to give an explanation of the mode in which the sound of the voice is transmitted through the chest.

As the voice is produced in the larynx, it must in all cases, whether weakly or strongly heard, be transmitted thence; and it would at first sight appear that the strong resonance is produced by a good, and the weak by a bad conducting power of the parts lying between the larynx and the parietes of the chest. Accordingly, it was long almost universally held by stethoscopical observers, that the increased resonance which accompanies a hard compressed state of the parenchyma of the lungs, or the presence of fluid in the pleura, depends on the increased conducting power of the intermediate substance. Several pathological facts, however, tend to throw doubt on the correctness of this explanation. For example, if the chest

be examined by repeated auscultation at successive intervals in the course of pneumonia, when there is hepatization of the lung, at one time very strong, at another only weak, resonance of the voice will be perceived, while the other signs, particularly percussion, shew that no change has taken place in the degree of hepatization. The cause of the occasional disappearance of the resonance of the voice is the obstruction by fluid matter of the bronchial tubes of the hepatized portion of the lung; for the resonance re-appears readily when the patient coughs, or makes a deep inspiration. This disappearance and return of the resonance, while in other essential particulars the hepatization remains the same, does not accord with the commonly assigned cause; for, according to it, it would be a matter of indifference whether the bronchial tubes contained air or not. In pleuritic effusion into the cavity of the chest, the intensity of the resonance of the voice diminishes as the quantity of the exudation increases; while the contrary should happen if the increased distinctness of the voice at any stage of the effusion depended on the superior conducting power of the interposed fluid.

Direct experiment also proves that condensed lung does not transmit sound better than healthy lung; for if the ear be applied to a stethoscope placed successively on corresponding parts of a sound and then of a hepatized lung removed from the body, the voice of another person who speaks through a stethoscope placed upon the lung at an equal distance in both cases, will be heard somewhat more distinctly in the sound than in the hepatized lung: but the distinction is so insignificant that, were the reverse the case, it

would not account for the very marked difference in such a condition of the lungs in the living subject.

In addition to these facts, a full consideration of the physical laws which regulate the transmission of sound (into which it is impossible to enter here) would shew us that the abstract principle of the superiority in the conducting power of dense bodies over rare ones, is not applicable to the explanation of the phenomenon in question; for here it must be remembered that sounds have to pass from one medium to another, which is always a great obstacle to their propagation. For example, a sound produced in the air may be perfectly distinctly heard in that medium, and yet when the head is immersed in water—a much denser medium—it may become totally inaudible. These facts and arguments therefore justify the conclusion, that the phenomena are not to be explained by any difference between the healthy and morbid lung in their power of conducting sound. More recently a quite different explanation, and which to us appears undoubtedly the true one, has been given of this phenomenon by Dr Skoda, viz. referring it to the law of consonance of sounds; and into some detail of this explanation it may be right here to enter.

A tense guitar string sounds in unison with a note produced in its vicinity, either by another musical instrument or by the voice. A tuning fork held in the air emits a much weaker sound than when placed upon a table or chest; the table or chest, therefore, must increase the intensity of the sound, by assuming the same vibrations as the tuning fork, or, in other words, by consonating with it. The note of a Jew's harp is scarcely perceptible when it is struck in the

air, but it is heard much more distinctly when played in the mouth. Thus the air in the mouth must increase the sound of the Jew's harp, *i. e.* must consonate with it.

The fact that a sound can be heard as distinctly at a distance as at the place where it is produced, can only be explained, either by its diffusion being prevented, and its being obliged to remain concentrated in its progress, or by its being reproduced in its course by means of consonance, and thus increased. But if a sound be heard louder at a distance than at the place where it was originally formed, this must be by means of consonance alone.

It sometimes happens that the voice is heard more strongly at the thorax than at the larynx, which in itself is sufficient to shew that its strength is increased by means of consonance within the chest. The different degrees of the intensity of the voice heard at the thorax, may be explained by the different strength of the consonance within the chest. To ascertain these changes, we must discover what it is within the chest that consonates with the voice, and by what circumstances the consonance is liable to be altered.

The voice, as it issues from the mouth, is composed of the sound formed at the larynx and the consonating sounds produced in the pharynx, mouth, and nasal cavities. This is shewn by the alteration the voice undergoes by the shutting and opening of the nostrils and mouth, while there is no change made in the larynx. The pitch of the voice is evidently fixed by the larynx alone, and the opening and shutting of the nostrils and mouth has no influence upon it; the ar-

ticulation of the voice, however, and its timbre, depend upon the mouth and nostrils.

As it is certain that the air in the pharynx, mouth, and nostrils consonates with the sound formed in the larynx, there can be no doubt that the air in the trachea and bronchia may also be thrown into consonant vibrations with the sounds formed at the larynx. Hence it is the air in the chest, and not the parenchyma of the lungs, which consonates with the voice at the larynx, as the latter seems ill adapted for consonating, being neither stiff nor sufficiently tense. Those substances, such as air, tense strings, membranes, slips of wood, and thin plates, in which a musical sound is most readily produced, are most easily thrown into consonant vibrations.

Air can consonate only when confined within a circumscribed space. In the open air, the human voice and every other sound are heard more feebly than in a room. The air confined within the box of a guitar, violin, piano, &c. consonates with the note struck on the strings, while the sound is not increased by the consonance of the external air. The strength of the consonance depends upon the size and form of the space in which the air is confined, and upon the properties of the walls which bound the space. It appears that the consonating sound of the enclosed air will be the stronger, the more perfectly the walls reflect the sounds which spread through the air; for a space surrounded by solid walls produces the greatest consonance, while in a linen tent the sound is but little increased.

The air enclosed in a defined space does not consonate with every sound; and should it consonate with

several different notes or sounds, it does not reproduce them all with the same degree of strength and clearness. No body can sound in consonance with another, unless it is itself capable of producing the same note, or one whose vibrations form an aliquot part of the note.

The deductions drawn from the physical principles just referred to, may be used in explaining the consonance of the voice in the chest. The air in the trachea and bronchia can consonate with the voice, in as far as their walls resemble the walls of the larynx, mouth, and nasal cavities, in their power of reflecting sound. In the trachea, the walls of which consist of cartilage, the voice consonates almost as strongly as it sounds in the larynx. In the two branches, also, into which the trachea divides, the consonance must be nearly as perfect. On the entrance of the bronchia into the parenchyma of the lung, they have no longer cartilaginous rings, but merely thin irregular plates of cartilage interspersed in the fibrous tissue. As the bronchia ramify, these plates become smaller, thinner, and less numerous, and at last disappear altogether, and the finest twigs of the bronchia consist merely of membranous canals. In the normal state of the parenchyma of the lung, the air in the bronchia consonates less strongly with the voice than that in the trachea, in proportion to the smaller number of cartilages they contain. The conditions which increase the consonance of the voice in the air, contained within the branches of the bronchia, that ramify in the parenchyma of the lung, are, that either the walls of the bronchia have become cartilaginous, or, if still membranous, very thick, or that the surrounding tis-

sue of the lungs has become devoid of air:—in all these conditions, the walls reflect the sound more strongly than the membranous walls of the normal bronchia; and there must be no interruption of continuity between the air in the bronchia and that in the larynx. If the air in a confined space be thrown into either original or imparted vibrations, which give rise to sound, the surrounding walls not unfrequently partake of the same vibrations; and they do this the more readily the less stiff and hard they are.

The organ-pipe vibrates when the air contained in it sounds. The same is true of the speaking-trumpet. The larynx vibrates with every sound produced in it, and its vibrations are perceptible through several inches of animal substance. The walls of the bronchia, which ramify within the parenchyma of the lungs, will, if the air within them consonate with the voice, be thrown into vibrations as readily as the larynx; and these vibrations may spread through a layer of fluid or muscle several inches thick, even to the parietes of the thorax, and the sounds produced by consonance in the bronchia will be perceptible at the walls of the chest.

The morbid states of the lung, which gives rise to increased resonance of the voice, depend upon the parenchyma becoming either infiltrated with foreign matter, or compressed from without. The former takes place in hepatization, infiltration of the parenchyma with tuberculous matter, and hæmorrhagic infarction, or the pulmonary apoplexy of Laennec. In all these morbid states, before the increased resonance of the voice can take place, all the air must be completely expelled from the air-cells, and the con-

densed portion of lung must be of sufficient size to contain at least one of the larger bronchial branches, which must contain air, and be in communication with the larynx. The latter is produced almost always by the presence of fluid or air in the cavity of the pleura: it is also, though extremely rarely, occasioned by a variety of other causes, such as tumours, aneurisms, &c. which compress the substance of the lung.

In this state the lung never reaches the same degree of solidity as in pneumonia or tuberculous infiltration, and therefore the resonance is never so considerable as in the latter affections. To admit of resonance being produced by compression of the lung, the compressed portion must contain a bronchial tube, sufficiently strong, from the number of its cartilages, to prevent the obliteration which happens to the merely membranous bronchia.

Varieties of the voice heard in the thorax.—In the healthy state, in all parts of the chest, except those immediately to be mentioned, there is heard no proper resonance of the voice, but merely an indistinct buzzing sound; but in the space between the scapulæ, the voice may in many persons be heard with different degrees of distinctness, and sometimes so strong that a moderate concussion of the ear may be felt. The same may likewise sometimes be perceived in the spaces below the clavicles, though in a less considerable degree. This resonance of the voice never reaches that degree of clearness and strength which may present itself at any part of the chest affected with hepatization or tuberclous infiltration.

The varieties in the morbid state are:

1. Strong bronchophony, *i. e.* that resonance of the

voice attended with simultaneous concussion of the ear, or, as Laennec describes it, which penetrates completely through the stethoscope.

2. Weak bronchophony, the voice without, or with imperceptible concussion of the ear, or which does not penetrate completely through the stethoscope.

3. The indistinct buzzing, with absence of all proper resonance.

4. The amphoric and metallic echoes.

The strong bronchophony.—The voice is heard as strong, or even stronger, or somewhat weaker, than in the larynx. Its appearance at any part of the chest indicates with certainty the existence under the spot of a solid condensed portion of lung of considerable extent, which may either be in contact with the walls of the chest, or separated from them by a layer of solid or fluid exudation in the pleura, of moderate thickness. The presence of fluid in the pleura can never of itself give rise to the strong bronchophony.

The diseased states whose existence may be suspected from the presence of strong bronchophony, are, pneumonia or pleuro-pneumonia, in an advanced stage, *i. e.* hepatization, without any or with a moderate amount of pleuritic exudation; tuberculous infiltration of the parenchyma; hæmorrhagic infarctus of considerable extent; thickening of the walls of the bronchia, with complete disappearance of the proper substance of the lung; carnification of the lung, or a very high degree of the œdema of the lung, along with pleuritic effusion, by which the air has been completely pressed out of the tissue of the lung. Of these, however, the hepatization and tuberculous infiltration are so much more frequently indicated, that

the others may in practice be almost left out of view, as they are not only very rare, but also seldom reach such a height as to produce strong bronchophony.

Laennec thought that the resonance from cavities was of a peculiar kind, different from bronchophony. He named it *pectoriloquy*, and conceived it to be pathognomonic of excavation in the lungs. On close examination, however, it will be found that, of the characteristic signs of pectoriloquy given by Laennec, only one refers to the voice itself, viz. that in pectoriloquy the voice penetrates the stethoscope completely, while in bronchophony it merely enters it; and all the others are only collateral circumstances, such as the circumscribed or diffused extent of the sound, its timbre, the general symptoms, &c. But, as in many conditions of the lung just described, the voice penetrates the stethoscope completely, the distinction proposed by Laennec falls to the ground, and pectoriloquy must be considered as nothing but strong bronchophony, and therefore cannot be received as alone sufficient to indicate with certainty the presence of a cavity. As a cavity in a hepatized lung is very rare, while in a tuberculous one it is very frequent, we shall, in the latter disease, when strong bronchophony is heard, seldom err in diagnosticating a cavern at the place where it is strongest; but here our diagnosis does not rest on the character of the voice alone, but is aided by the other stethoscopic signs, and the general symptoms and course of the disease.

Weak bronchophony.—To constitute weak bronchophony, the voice must be clearly and distinctly heard, but accompanied by little or no concussion of the

ear. It may attend any of those diseases above enumerated as giving rise to strong bronchophony, and in addition pleuritic effusion of considerable extent, and hydrothorax. Its presence alone is insufficient to determine the existence of fluid in the pleura, but recourse must always be had to percussion, auscultation of the respiration, and position of the neighbouring organs, &c. in making the diagnosis.

Egophony.—A peculiar modification of the resonance of the voice has attracted the attention of stethoscopists, and there has been much discussion (on which our limits do not permit us to enter) to determine its cause and value as a diagnostic sign. It was conceived by Laennec to indicate the presence of a thin layer of fluid between the lung and the walls of the thorax; but later observations have established the fact, that it has been heard in cases of pneumonia and tuberculous infiltration, where there was no fluid at all in the pleura, also in cases where there was a very large collection of fluid in the pleura, and that it has been absent in cases of effusion of various amount; and finally, in some cases of effusion into the chest, as well as in pneumonia, without any fluid being contained in the pleura, individual words or even syllables partake of the trembling or egophonic character, while others are destitute of it. Egophony may be therefore regarded as a mere modification of bronchophony, which has no essential connection with the existence of fluid in the chest, and has otherwise no particular importance.

The strong as well as the weak bronchophony passes imperceptibly into the indistinct murmur, and there is no defined boundary between these two sounds. It is easy, indeed, to distinguish between the extremes;

but the transition sounds it is extremely difficult to recognise. No conclusion should be drawn from the resonance of the voice, unless it possess the unquestionable character of bronchophony.

3d. *Indistinct buzzing sounds.*—This resonance of the voice affords no definite indication. It does not indicate that the organs are in a state of health, for, as many conditions are required to produce bronchophony, the absence of any one may prevent its appearance, *e. g.* the bronchial tubes may not be open, but obstructed with mucus, so that the consonance cannot take place, while, at the same time, any one of the morbid conditions just mentioned may be present.

Auscultation of the respiration.

The passage of the air through the respiratory tubes causes in the healthy state certain sounds which are variously modified by disease.

The sounds produced by the respiration in the larynx, trachea, and larger bronchia, are of a rushing character, most closely imitated by impelling the air against the hard palate, with the vocal organs in the position necessary for pronouncing the consonant *ch*, German, or χ, Greek. In gasping it is produced involuntarily. The pitch may differ according to the width of the opening admitting the air, and is generally higher in the larynx than in the lungs; but the character just mentioned remains always constant.

The respiratory murmur in the air-cells and smaller bronchia resembles very nearly the sound produced by drawing in the breath with the lips nearly closed, or pronouncing the consonants *v* or *b* while inspiring, or, as it were, by sipping the air. It is only heard during inspiration; and during expiration there is

heard, in the air-cells and smaller bronchia, either no sound at all, or a very slight blowing noise between the sound of *f* and *h* pronounced in expiration. The respiratory murmur in the air-cells is heard most strongly and distinctly in children.

Varieties of respiratory sounds.—1. Vesicular respiration; 2. bronchial respiration; 3. indeterminate respiratory sounds; 4. amphoric and metallic respiration.

The name *vesicular respiration* can only be applied to that respiratory murmur which resembles sipping air, as above described. No other sound which does not display this character distinctly can merit the appellation, even although occurring in healthy individuals. Such a sound can be produced in no other way than by the penetration of the air into the air-cells. The sound during expiration has no connexion with vesicular respiration, for it may be entirely wanting, or may be strong or weak, without in the least influencing our judgment as to the presence or absence of the vesicular murmur. The cause of the vesicular murmur is the friction of the air against the walls of the air-cells and fine bronchial tubes, which, by their contractility, oppose a certain degree of resistance to its entrance. From this may also be explained the great disproportion between the strength of the respiratory murmur in the pulmonary cells during inspiration and during expiration, for in the latter the air encounters no resistance. The case however is different in the larger bronchia, and more especially in the larynx and trachea, for the air has no resistance to overcome in its passage through these during inspiration; on the contrary, it is rather drawn

in by the rarefaction of that within the chest, while in expiration it passes from a larger space,—the air-cells,—into a smaller one, the bronchia, trachea, and larynx,—and is consequently compressed; therefore the expiration is usually louder in those parts than the inspiration. The presence of the vesicular respiration in any part of the lung is incompatible in it with any of those diseased states which prevent the penetration of the air into the air-cells, viz. compression of the parenchyma by exudation, tumours in the chest, enlargement of the heart, infiltration of the parenchyma, with plastic (that is pneumonic) or tuberculous matter, or with blood, serum, &c. But it can co-exist quite well with solitary tubercles, however numerous, and with inflammation confined to single small lobuli, *i. e.* lobular hepatization, and is frequently found along with these morbid changes.

The vesicular respiration may be increased to puerile respiration, which depends upon rapid and deep inspiration, and increased resistance of the cells; or it may be rough, from a change in the constitution of the lining membrane of the bronchia. The rough vesicular murmur indicates the least degree of swelling, and is always combined with increased loudness of sound. The vesicular respiration passes insensibly into the indeterminate respiration, and the rough respiration passes into the rattles, to be mentioned presently.

The vesicular respiration may occur without any sound in expiration, or such a sound may be present in various degrees of intensity. When a sound is present in expiration, it always indicates that there exists in the bronchia some obstacle to the exit of

the air, and this generally consists in a swelling of their lining membrane.

Bronchial respiration.—To admit of a sound being recognised as bronchial respiration, it must have the same character as laryngeal or tracheal respiration, and can only differ from these in its pitch. It is imitated by breathing with the vocal organs in the position necessary for pronouncing the consonant *ch*, as before explained, or by blowing through a tube.

The bronchial respiration indicates precisely the same states as the weak bronchophony, and these need not be again enumerated. But it never occurs in the normal condition of the respiratory organs, and therefore it always indicates a morbid state, even when occurring in the space between the shoulder-blades, except in the neighbourhood of the first dorsal vertebra, where it is heard in rare cases in healthy subjects, in dyspnœa, or deep inspiration.

The production of the bronchial respiration, like bronchophony, has been attributed, by Laennec, Andral, and others, to the increased conducting power of the condensed lung, which renders the rushing noise of the air streaming in and out of the bronchia more audible. But, in addition to the foregoing arguments opposed to the theory of the better conduction of the voice depending on the condensed state of the lung, the following is conclusive against this opinion. As the bronchia are merely passages for conducting the air into and out of the air-cells, the more the latter are capable of being expanded and contracted, the greater will be the streaming of the air through the bronchia, and *vice versa*. But in the healthy state, where the streaming of the air is great-

est, there is no bronchial respiration at all; while, in a completely hepatized lung, where there can be no expansion or contraction of the tissue worth mentioning, and consequently no streaming of air through the bronchia, the bronchial respiration is loudest. The true explanation is undoubtedly that of Dr Skoda, viz. that it is from the air in the bronchia vibrating in consonance with the respiratory sound of the larynx, trachea, and bronchi, the condition necessary for consonance being afforded by the condensed lung, as already explained under the head of bronchophony.

The bronchial respiration may be in pitch higher or lower, and in intensity weaker or stronger, than the laryngeal respiration; differences which depend upon the part of the windpipe with which the air in the bronchia consonates, for it does not always consonate with the larynx. These differences depend on other circumstances likewise, which it is unnecessary to detail here.

The *cavernous respiration* of Laennec differs in no essential particular from bronchial respiration, and cannot be taken as a diagnostic sign of a cavity, unless accompanied by the amphoric or metallic echo.

The respiratory sound, named by Laennec *respiration soufflante*, and described by him as giving rise to the sensation, when listened to, as if air was drawn from the ear of the auscultator during the inspiration, and blown into it during the expiration of the patient, is merely a strong form of bronchial respiration; and its strength depends not only upon the greater or less distance of the bronchus, or cavity in which it is formed, but also upon the rapidity and amount of mo-

tion in the lungs, and the more or less perfect consonance of the parts.

Indeterminate respiratory sounds.—Under this term are comprehended all those respiratory sounds which cannot be referred to any of the preceding forms of respiration, or to the rattles or friction of the pleura, to be afterwards described. The respiratory murmur in the air-cells is sometimes so ill marked as to be indistinguishable from the respiratory sounds which spread from the deeper bronchia or larynx, and a weak rattle at a distance may resemble an indistinct respiratory murmur in the air-cells. As such a respiratory murmur may arise from many causes, it is impossible to say what is the cause in any given case,—whether it be the entrance of the air into the air-cells, the stream of air into the larger bronchia, or a distant rattle, or two or more of these combined. Neither the sound derived from the larger bronchia when it is not bronchial respiration, nor the indistinct respiratory murmurs, afford grounds for forming any conclusion as to the condition of the parenchyma of the lungs. Such being the case, any subdivision of them is superfluous, and they may be all included under the name of indeterminate respiratory sounds. Although a very skilful ear may be able to detect the transition of the distinct forms of respiration into the indeterminate, yet whenever a sound is at all doubtful, it is much better to class it among the indeterminate, and to call in the assistance of the other signs and indications in forming a diagnosis.

The rattles.—The rattles are sounds produced in respiration by the breaking of the air through fluids, such as mucus, blood, &c.; and sometimes by its

passing over solid substances, such as folds of mucous membrane, which, in consequence, may be thrown into vibration. Most of these resemble the bursting of bubbles; others are like the creaking of leather, crepitation of salt, &c.

They differ very much in the loudness and clearness with which they are heard; also in dryness and moistness, in frequency, size of the bubbles, &c.; but to describe all these circumstances would lead into too minute details for the present object.

Division of the rattles.—1. The vesicular rattle; 2. the consonant rattle; 3. the crackling or dry crepitating rattle with large bubbles (*râle crépitant sec à grosses bulles, ou craquement*, of Laennec); 4. indeterminate rattles; 5. rattles with amphoric echo.

The *vesicular rattle* is that produced in the air-cells and small bronchial tubes. Its peculiar character is, that the bubbles are very small and of equal size. It indicates the presence of fluid, such as mucus, blood, or serum, in the finest bronchial tubes and air-cells, and also that the latter are penetrated by the air. Its presence, therefore, shews that none of the morbid conditions which prevent the entrance of the air into the air-cells can exist.

This sound corresponds to the moist crepitation of Laennec, which he considered as pathognomonic of incipient pneumonia. Its occurrence, however, in its pure form, is rare in pneumonia; and it is likewise heard in other morbid affections, such as œdema of the lungs, tuberculosis, and even common catarrh. With the view of obviating this difficulty, Laennec divided it into crepitating and subcrepitating; but as numerous facts attested by Andral, Chomel, Cruveil-

hier, and Skoda, prove that this is not a sufficient distinction, the presence of the crepitating rattle can only be held to prove the existence, from some cause or other, of fluid in the air-cells, and their permeability by air; and we can only conclude that pneumonia is present, if we discover its other indications.

The *consonant rattle* is clear, high in pitch, and the bubbles which form it are unequal in size. Such a rattle has its origin in the larger branches of the bronchia, and in the trachea; but when heard at the parietes of the chest, after having been transmitted through the lungs by conduction, it loses much of its height and clearness. If, however, the conditions for consonance are present in the normal state of the parenchyma, it is heard of an intensity and clearness equal to that at the place of its origin. The consonant rattle is therefore diagnostic of the same state as bronchophony and bronchial respiration; but as rattles seldom occur in exudation, it indicates in general pneumonia or tuberculous infiltration.

Laennec's dry crepitating rattle.—This sound, according to Laennec, resembles that made by the blowing up of a dry pig's bladder. It is held to be a pathognomonic sign of vesicular and interlobular emphysema; but it occurs only in those cases in which the cells are expanded to the size of a barley-corn or bean, and communicate with a bronchial tube. It occurs also when the bronchial tube is expanded into a sac, and in excavations of the lung which do not communicate with the bronchia by too wide an opening, and have membranous walls. The cause of the appearance seems to be, that the air-cells, from having lost their resilience, instead of contracting du-

ring expiration, merely collapse when the air leaves them; and on the return of the air on inspiration, are suddenly expanded with a crackling noise.

It is doubtful, however, whether it be possible to distinguish this sound from that made by the presence of tough mucus in the air-cells and finer bronchial tubes.

Indeterminate rattles.—Under this head are included all those rattles commonly called mucous rattles, which are not vesicular or consonant, and are not accompanied by the amphoric echo. They afford no information as to the state of the parenchyma of the lungs, and therefore indicate merely the presence of fluid in the bronchial tubes.

Amphoric echo and metallic tinkling.—In speaking into an empty earthen-ware vessel with a dilated body, there is heard, besides the voice, a peculiar humming sound; this represents the amphoric echo of Laennec. There is likewise heard in such a vessel, but better in large spaces enclosed with solid walls, such as chambers, and especially vaults, frequently a metallic echo accompanying the voice if somewhat loud. This is the metallic echo or tinkling. In a tube that is not very wide, the amphoric echo is never produced.

In cases where there is a large cavity in the chest, whose walls are disposed to reflect sound, and which contains air, a similar sound occurs. As the conditions for its occurrence are, that the cavity be large and contain air, it has only been met with in cases of extensive excavations of the parenchyma of the lung, and in pneumothorax. Laennec believed that a cavity must contain air and *fluid* to enable it to exhibit

these appearances, and his opinion has been universally adopted. But the presence of fluid is quite superfluous, as both a jar and a chamber produce the sound without their containing any; and if an inflated stomach, in which there is no fluid, be spoken against by means of a stethoscope, the amphoric echo and metallic tinkling are heard within it.

Laennec believed further that the cavern in the lung, or the cavity in the pleura, must communicate with a bronchial tube to enable the sounds to occur. But it is only in the rarest cases of pneumothorax that a communication with the bronchia remains, while the amphoric and metallic sounds are an almost constant attendant of this morbid state. In the experiment with the stomach just mentioned, there was no communication with the external air; and this leads us to the true explanation, which seems to be, that the air contained in one of the bronchial tubes consonates with the voice, and produces vibrations within the cavity of the pleura, or cavern in the lung, from which it must not be separated by more than a thin layer of parenchyma.

The mechanism of these sounds will be easily understood, if we keep in mind that they are merely the peculiar character given to the sounds of the voice and respiration already described, by their being re-echoed in a space of considerable size filled with air.

The amphoric respiration, or *bourdonnement amphorique*, arises either from the respiratory sound in a large bronchial tube which opens into a cavity, or the re-echoing in the pleura filled with air of the bronchial or consonating respiration in a neighbouring tube.

The metallic tinkling, *tintement metallique*, may arise from bronchophony, from rattles, or from the agitation of fluid produced by coughing, or violent motion, re-echoing in a cavern, or in the pleura when filled with air. Of these causes, by much the most frequent is the rattles.

The motion of the lung upon the pleura may, in certain morbid states of these organs, be attended by sounds indicative of the nature of the disease. In the normal state the surfaces of the pleura in contact with each other are perfectly smooth, and no sound is produced by them; but in certain diseased states, abnormal sounds are heard, and these are found always to depend upon roughness of the membranes, or rough protuberances on the surface of the lungs.]—(EDITORS.)

Connected with the function of respiration is that of calorification, the heat of the body in general being found pretty accurately to correspond, as has been elsewhere explained, to the quantity of oxygen absorbed by the arterial blood in the lungs, as dependent probably upon the condensation of this oxygen. The intensity of the respiration, and the absolute quantity of blood arterialized in a given time, must be the only criterion of the absolute quantity of caloric generated; but the distribution of this caloric to the various parts of the body seems to be variously modified by the quantity of arterial blood which each part, not in a given time receives, but at any given time contains. It is urged by some, that unless the part in question actually *receives* more blood in any

given time, that is, unless the blood were in that part renewed more quickly than in others, the heat would soon subside; and this is taken as an argument in favour of the opinion, that more than the natural quantity of blood passes through inflamed vessels. This is absurd. Supposing the capillary vessels of a square inch of surface to contain at any given time, in their natural state, ʒi. of blood, and in their inflamed state, owing to their greater calibre, ʒii., while in both states the addition made every minute is ʒi., at 104 deg.; the cooling power of the atmosphere will of course take effect more readily on the blood in the undilated vessels, the circumference of which is so much greater in respect of their area, than in the dilated ones, the circumference of which is so much less; so that if it be sufficient in the former to bring down ʒi. 6 deg. in a minute, it will probably in the latter not bring down the same quantity more than 3 deg. in the same period, and consequently (the quantity received in any given time being in both cases the same) the surface will be 98 deg. in health, 101 deg. in inflammation. Dr Philips endeavoured to illustrate this effect of increased heat by supposing that several rooms are heated with steam, and that more pipes are introduced into one room than into the rest. But this will not do, unless we admit that this greater number of pipes in any given time conveys a greater quantity of steam, while, by his own admission, the vessels of an inflamed part do not transmit a greater quantity of blood. The fact can be consistently explained only by presuming that the blood in an inflamed part cools more slowly, for the reason above assigned, than in others. Perhaps, however, the increased depositions

going on after a time in an inflamed part, *i. e.* the conversion of the liquid blood into certain solid tissues, may contribute to this increased heat. But it is difficult to assign much influence to this cause, since either the increased deposition will very soon be over, or, if it continue, its effects in this way will probably be counteracted by an equally increased absorption.

The heat of the whole surface of the body is diminished during the first stage of fever (the shivering or tremors attending this stage being merely the consequence of the abstraction of their accustomed stimulus from the neighbouring muscles), and it is increased during the second stage; while it does by no means follow that the absolute heat of the body is not in both cases the same, the only difference consisting in the increase of it in the internal organs in the former case, owing to the retention of the blood in these organs, from the constriction of the cutaneous vessels; and in the external in the latter, owing to the accumulation of it in the cutaneous vessels, which have now become relaxed. Nor are we to be deceived by the sensations of the patient in these opposite circumstances, the internal organs being comparatively insensible, and therefore not affected by the accumulation of heat in the first stage of fever, nor by its abstraction in the second, whereas the external organs are acutely sensible of every variation in this particular. The same peculiarities, also, with respect to cold and heat, as occur on the surface in general in fever, take place also in every part in local inflammation; the diminution of heat, however, in the first stage, being much less remarkable than its increase in the second. The heat is not however

equally increased in every species of inflammation, being generally most considerable in the phlegmonous, and successively less so in the erythematic, scrophulous, and scirrhous, differences which manifestly depend upon the general greater or less vascularity of the several tissues in which this inflammation takes place. In none of these cases however does the heat rise many degrees above the natural standard, unless the attendant fever be such as to increase considerably the intensity of the respiratory process, and consequently the quantity of condensed oxygen, in which case, the arterial blood at the heart being hotter than natural, say 109 or 110 instead of 104 deg., the parts in which it is accumulated will of course rise in proportion, and the temperature of the surface of the body, instead of being only 101 or 102 deg., as in merely local inflammation, with fever, may rise to 106 or 107 deg. Nay, in some cases, as in the eruptive stage of scarlatina, the heat of the surface has, in some extraordinary cases, been as high as 112 deg. F., a circumstance which can be attributed, as has just been said, only to the intensity of the respiratory process, and the consequent condensation, in a given time, of an inordinate quantity of oxygen. In the hectic habit, the heat is generally most remarkable in the palms of the hands and the soles of the feet, which, like the heat of the face in blushing, depends upon the inordinate retention of blood in these parts. In some cases, the accumulation of heat is rather apparent than real: such is the case with regard to the scalding tears in incipient ophthalmia, and the ardor urinæ in the beginning of gonorrhœa. In these cases the sensation

of heat is excited, not by the fluids in question being actually hotter, but from the surfaces over which they pass being less defended from them, owing to the suppression of the secretion of their natural mucilage, depending upon the constricted state of their capillary arteries. It is from the same cause, as has been likewise already remarked, that sneezing is a symptom of incipient catarrh, the nostrils being less defended than naturally from the irritation of the inspired air. All these facts strikingly corroborate the doctrine, that a constricted state of the arteries always precedes the dilated state of them, in which inflammation consists. With respect to diseases not either febrile or inflammatory, the chief peculiarity connected with our present subject is the diminution of heat, either general or partial, which some of them display. Thus, in morbus cæruleus, as has been already remarked, the heat of the whole body is in general considerably below the natural standard, sometimes as low as 74 deg. F., chiefly from the arteries containing a portion of blood not arterialized, and consequently without the requisite proportion of condensed oxygen, but partly perhaps from the turgescence of the venous system, and the comparative vacuity of the arterial, since the same thing is found to occur in some degree in most of the organic diseases of the heart, in which there is no mixture of venous and arterial blood, but only a loss of the proper balance between them. So much for the general heat of the body. The local heat is in general diminished in parts affected with dropsy, probably by the abstraction of caloric by the accumulated water; and it is for a similar reason, probably, that very fat persons are extremely susceptible

of cold. It is commonly said that the local heat is generally diminished in paralytic parts, but this is not always the case. In gangrene, the heat of the affected part is of course entirely lost, for arterial blood no longer reaches it; and after the death of the fœtus, a sensation of cold is frequently experienced in the belly, for reasons which are sufficiently obvious.

CHAP. V.

CIRCULATING SYSTEM.

STIMULUS TO HEART'S ACTION—ASPHYXIA—SYNCOPE—THE PULSE—PULSE IN INFLAMMATION—ATTENTION OF THE ANCIENTS TO THE PULSE—[AUSCULTATION OF THE HEART—VARIETIES IN THE BEAT—VARIETIES IN THE SOUNDS—ORIGIN OF THE SOUNDS—ABNORMAL SOUNDS—IMPERFECTION OF THE VALVES—CONTRACTION OF THE ORIFICES—EXCRESCENCES ON SURFACE OF VALVES—INDICATIONS AFFORDED BY ABNORMAL SOUNDS—SOUNDS THAT ARISE IN PERICARDIUM.]

We have now to pass on to the action of the heart, as displaying inordinate phenomena in disease. The action of the heart may take place either in too quick or too slow succession; it may beat upon less or more than its usual quantity of blood; and it may expel this blood with less or more than its usual impetuosity; and the pulse of the arteries will accordingly be either too quick or too slow, too weak or too strong, too hard or too soft (terms to be considered always as used not absolutely, but with relation to the natural pulse of the individual), the quickness dependent upon the succession, the strength upon the volume of blood, the hardness upon the impetuosity of its influx. The action of the heart may be also intermittent at regular intervals, or in every respect irregular, and the pulse of the arteries will of course correspond with it. In speaking of the pulse as affected by disease, no account will be taken of any

thing but the action of the heart, since the arteries have nothing to do with the circulation. Now all these states of the action of the heart, with numerous others less easily defined, must necessarily depend on some change in either the irritability of the heart, the stimulus by which it is excited, or the organic condition of the heart and arteries themselves. That a primarily increased or diminished irritability of the heart is ever the cause of a preternatural state of the pulse, is quite conjectural, while, on the contrary, any increase or diminution of its accustomed stimuli, as it unquestionably takes place from numerous accidents, so it is certainly the most frequent cause of preternatural varieties of the pulse. The *chief* ordinary stimulus to the heart is on the left side arterial, and on the right venous blood, the former derived from the lungs, and the latter from the rest of the body; and it accordingly follows, that where these supplies of blood are either too little or too great, the action of the heart must be proportionately affected. The arterial blood, then, being derived directly from the lungs, it follows, that as respiration is affected by any peculiarity of the action of the heart, so the latter is affected by any peculiarity in respiration, but not in an equal degree, since it is well known that respiration may be not only variously modified, as in speaking, singing, and so forth, without any corresponding change in the pulse, but considerably either accelerated, as in peripneumonia, or retarded, as in asthma, without a proportionate acceleration or retardation of the pulse; while, on the contrary, every acceleration or retardation of the action of the heart produces in general a precisely proportionate effect

on respiration. This circumstance has been fully alluded to while speaking of the functions of the lungs and heart in their healthy state; and the fact is easily explained, when we reflect that the quantity of air contained at any given time in the lungs is perhaps six times as great as that received and voided at each successive act of respiration, so that they do their work by affording a proper stimulus to the left side of the heart, in some measure independently of the mere mechanism of this process; while, on the contrary, the quantity of blood contained at any given time in the right side of the heart is not more than one-third greater than that which it expels at each systole of this organ, so that this quantity is much sooner affected by every change in the heart's action, and becomes a stimulus to the lungs, greater or less almost in exact proportion as this action is increased or diminished. It is upon these principles, as before observed, that we must explain why the pulse is not affected by voluntarily suspending the respiration, and why, in asphyxia, the action of the heart does not immediately cease, although a cessation of respiration is the immediate consequence of syncope. It is true that in both these states (when perfectly established) the action of both lungs and heart is equally suspended; and as this cannot happen without a suspension of the action of the brain also, the three states of asphyxia, syncope, and nervous apoplexy, are frequently, but very improperly, confounded together.*

* The very term, indeed, asphyxia, or asphygmia, is derived from the cessation of the pulse in this disease, as its other ancient names, lipopsychia, lipothymia, &c. are from the cessation of the action of the brain; but we must not allow ourselves to be deceived by names, these terms being derived, not from the first, but from the second

The only essential difference between asphyxia and syncope (seeing that in both, when perfect, the action of both heart and lungs is suspended) seems to consist in this, that in the former the disease begins with the lungs and extends to the heart, while in the latter it begins with the heart and extends to the lungs. In both of these the brain, of course, is *immediately* involved, and the only difference between these two states and nervous apoplexy seems to consist in this, that in the latter the disease begins with

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and third links in the chain of the proximate cause of this disease. This confusion originated with the ancients, and has been ingeniously perpetuated by the nosologists, who regard nothing but symptoms, and take no notice whatever of proximate causes. Thus, asphyxia, as occasioned by deleterious gases, drowning, or hanging, was referred by Cullen, in the earlier editions of his work, to the head of *syncope*, and in the later (after Wepfer and Boerhaave) to that of *apoplexy*, under the titles apoplexia venenata, and suffocativa, though how he could contrive to get the causes to operate primarily, either upon heart or brain, or in his natural judgment to reconcile the phenomena of asphyxia with "suspenso motu cordis et arteriarum," in his definition of apoplexy, does not immediately appear. It is the more surprising that the impediment to respiration, as the first link in the chain alluded to, should have been so long overlooked, not indeed in fact (for Cullen was among the first to recommend artificial respiration as the most effectual remedy for this affection), but in nosology, which is a very different affair, since not only Thurston and Bonet, a century before the time of Cullen, but even Fallopius and old Cardan, had noticed that it was in vain hanging fellows whom nature (probably in anticipation of such an accident) had provided with an osseous trachea; and since in his own days Dr de Haen, Monro, and others, had found that the brain of dogs killed in this way betrayed in general no apoplectic symptoms, and that a dog in the last agonies from this cause might always be recovered by making a hole in his trachea, below the noose; proving that this cause at least, and therefore probably all the rest, operated through the medium of the lungs alone, and the affection of the heart and brain was, as the nosologists would say, altogether symptomatic.

the brain, and extends to the lungs and heart, which however it does not always do till after a longer or shorter interval, the function of the brain being much less essential to that of the lungs and heart, than the function of the two latter to that of the brain. Syncope is universally admitted to consist in a suspension, to a greater or less degree, of the action of the heart; but the immediate cause of this suspension has been questioned. It was at first attributed to an accumulation of crude humours of some kind or other in the heart; and even the celebrated Lower ascribed it to the coagulation of the blood in that organ. A better pathology may be said to have originated with his contemporary Willis, and was subsequently established chiefly by the writings of Hoffmann and his followers, by whom this suspension of the action of the heart was ascribed to some defect of the ordinary stimuli acting upon this organ, one of the chief of which is a proper supply of arterial blood from the lungs.

But, in the second place, the lungs may transmit, not only too little, but too much blood to the left side of the heart, not indeed absolutely, but with reference to its capability of receiving it; and it is in this way, most probably, that all diseases of this organ,—attended with either a constriction of its cavity on the left side, or an accumulation of blood therein, such as carditis of the left side, rheumatism of the heart in general, hypertrophy of the left ventricle, combined with either a diminished state of its cavity, or aneurism, aneurism of the arch of the aorta, ossification of the valves of the left side, and dropsy of the pericardium,—commonly give rise, not only to diffi-

culty of breathing, but to an irregular pulse, and a great tendency to palpitation of the heart, and syncope—the blood being now a *load*, and not a *stimulus*.

In the third place, the supply of venous blood may be too little, as in venesection, and the long-continued erect posture, and thus occasion syncope, partly directly, partly indirectly; and, lastly, the supply of venous blood may be too great, as in the cold stage of fever, the accumulation of blood in the right, and probably also in the left side of the heart, owing to the internal circulation in this state giving rise, if moderate, only to a quick and weak pulse, but if intense, to perfect syncope. It is the opinion of Dr Holland, that syncope always arises, not from too little, but from too much blood in the heart; and he conceives that its exciting causes *all* act by increasing the proportion of inspirations to the expirations, and thus overloading the heart, or at least the right side of it. He observes, that if the heart had less blood at the time of the paroxysm, death would inevitably be the consequence, as "this is its only stimulus;" but this appears to be a mistake, since it certainly has an additional stimulus from the brain; and if this were not the case, death would be equally inevitable from the syncope arising from too much as from too little blood, since what was at first insufficient to excite the heart must be presumed to be always so. Each ventricle of the heart naturally contains, after its systole, about one oz. of blood, and upon the addition of two oz. contracts; but syncope may equally result if it receive less or more than its two oz. (one, for instance, or three); in the former case from the stimulus being insufficient, and in the latter

from the load being too great. The mischief can in either case however be repaired by the brain alone, which can transmit a greater stimulus in the former case, to make the action of the stimulus acting on the heart equal to natural; in the latter, to make it greater than natural, to compensate for the greater weight to be propelled. Such, then, seems to be the nature of syncope in general, and the cause of the supervention of this state from any change in the supply of blood. A second necessary stimulus is that of the brain, which, if quite cut off, may equally produce syncope, but if only diminished, as in apoplexy, the ventricle will allow a greater than usual accumulation of blood in it before it acts, and the pulse will therefore be *slow*; it will transmit at each beat a greater than usual quantity of blood, and the pulse will therefore be *strong*; and it will propel this blood with a more languid motion than natural, and the pulse will therefore be *soft*. So much, then, for changes in the state of the pulse, from changes in the ordinary stimuli to the ventricle. But it is liable to be acted upon by many preternatural stimuli; it participates sympathetically with any organ in a state of inflammation, under which (speaking in a general way) the pulse will be the very reverse of what it is in apoplexy: it will of course be *quick*, because the ventricle will act before it has received its usual supply of blood; it will be *weak* (supposing it to retain the usual quantity after each contraction), for the ventricle will throw at each beat a smaller than usual volume of this blood into the arteries; and it will be *hard*, for the ventricle will eject this blood with more than its usual impetuosity. Between these two extreme kinds of pulse (in which

there are all the attributes, on the one hand, of a generally diminished, on the other, of a generally increased action of the ventricle) there is almost every possible variety, arising from endless peculiarities in the nature of this additional stimulus of sympathy, or from inordinate distributions of the blood, so that the pulse is, when quick, generally weak, as in peritonitis, and when slow, generally strong, as in apoplexy; it is sometimes at once quick and strong, as in peripneumonia and the second stage of fever. This must be explained, in the former case, from the peculiar nature of the new irritation, which, though it is sufficient to make the ventricle act before it has received its usual supply of blood, and should consequently, supposing the ventricle to retain its accustomed quantity after each contraction, render the pulse weak, yet, by determining a greater *degree* of this contraction, seems to expel a greater quantity than usual, and thus renders it at once quick and strong. In health say it acts upon 3 oz. 70 times in a minute (natural), and expels 2 oz. (natural). In peritonitis it acts upon $2\frac{1}{2}$ oz. 100 times in a minute (quick), and expels $1\frac{1}{2}$ (weak). In peripneumonia it acts equally upon $2\frac{1}{2}$ oz. 100 times in a minute (frequent), and expels the whole (strong). In the one the contraction is more sudden, in the other more perfect, and it is only in fever that we can bring in inordinate distributions of the blood as causes of differences in the pulse. When we reflect that each organ of the body has a specific character of irritability, and consequently that the inflammation of every organ must be attended with an irritation of a specific kind, and communicate of course a sympathetic irritation equally specific, we should *a priori*

imagine, what is perhaps in fact the case, that in no two inflammations or diseases of any kind would the action of the heart be affected in a precisely similar manner; and it is upon this presumption that the whole art of detecting diseases by the pulse alone proceeds. Of this, however, we shall have occasion to speak more fully presently. In the mean time, however, we may observe (in order to obviate an appearance of inconsistency), that in cases of acceleration of the pulse in inflammation, the secondary irritation arises from sympathy, not with the vessels actually inflamed, but with the tissues immediately in contact with these vessels. The state of inflammation has been here always represented as one of diminished irritation in the vessels immediately affected, and it implies an absurdity to suppose that diminished action in one part can be a cause of sympathetic irritation elsewhere. But a necessary consequence of a diminished irritation of the capillary arteries is a dilatation of these vessels by blood, and consequently an inordinate pressure exercised upon the neighbouring tissues, which are thus preternaturally irritated; and it is accordingly the new irritation of these tissues which must be presumed to extend its sympathetic action to the heart. Among these tissues are the sensific nerves of the part, and it is remarkable that the acceleration of the pulse from local inflammation is generally in the direct ratio of the pain excited, so that we should be perhaps justified in concluding that the excitement of the pulse in these instances depended not so much upon sympathetic irritation properly so called, as on the excitement of the sensorium, and a new stimulus sent in consequence

from the brain to the heart. Whether however this be the case in all, or even in most instances, is questionable; but at any rate it is certain that the new irritation of the heart cannot, consistently with what we have all along maintained, be considered as dependent on that of the vessels directly inflamed, but must be referred to that of the contiguous tissues. Besides sympathy with common stimuli influencing the action of the heart, is violent emotion, so well known as the cause, on the one hand, of syncope, as has been already mentioned, and on the other, of palpitation, which may arise as well from this cause as from various diseases of the heart itself. In some instances of palpitation, the motion of the arteries precisely corresponds with that of the heart, whence it has been presumed with reason, that the ventricles are the seat of palpitation. In others, on the contrary, the motion of the arteries does not correspond with that of the heart, as influenced by the palpitation. In these instances it has been presumed, with equal reason, that the auricles are the seat of the morbid affection; for although their action during health is so slight as not to be recognisable by any sign, it is easy to conceive that such will not be the case in disease. A still greater degree of the same causes which produce palpitation may give rise to a failure at intervals of the irritation of the heart, owing to the collapse succeeding inordinate excitement, and thus occasion an intermittent pulse; and this failure, when long continued, constitutes syncope, in which the pulse is frequently altogether imperceptible. Besides the peculiarities in the chief stimuli by which the heart is excited, the changes in the organic condition of the heart and

arteries themselves have been mentioned (independently of the effects of these on the blood) as sometimes a cause of irregularities in the action of the heart and pulse. Thus the beat of the heart is, for sufficiently obvious reasons, strong in hypertrophy of the left ventricle of this organ, as well as diffused over a much wider space than natural. The pulse, moreover, is always weak beyond the seat of an aneurism and a stricture or an ossification of an artery, and hence it is frequently weaker at the left wrist than at the right in aneurism of the arch of the aorta, provided the seat of this is beyond the origin of the arteria innominata. By a late profound nosologist, this circumstance is attributed with singular felicity to "a spastic state of the artery, produced by the stimulus of the aneurism."*

* From the earliest periods of medicine, the state of the pulse has been more attended to and relied on, than any other symptom of disease. In China, the records of which extend much farther back than the reputed era of the creation of the world, the sphygmical art, as it is pedantically called, has been almost exclusively trusted to in the discrimination of diseases; and it is said that the native Chinese, Indian, and Persian doctors of the present day can ascertain, by their excellence in this art, the various circumstances of disease, to a degree which to us appears incredible. Hippocrates seems to have relied less on the state of the pulse than on that of the respiration, to which he paid particular attention, as he conceived that all the morbific matters whence disease arose entered the body in general with the inspired air. Indeed it is asserted by Sprengel and others, that no notice is ever taken of the pulse in the works of Hippocrates; but this is certainly a mistake, although, in comparison with the remarks afterwards made on the pulse, his observations sink into nothing. Celsus very seldom alludes to the pulse, which he calls "fallicissima res." The sphygmical art may be said to have originated with Praxagoras, and his pupil Hierophilus, who is reported to have set the pulse to music; and it was further cultivated by Cælius, who enumerates above fifty kinds of pulse. All previous authors, however,

It remains to say a few words on the application of the stethoscope in ascertaining irregularities in the action of the heart.*

as usual, sink before Galen, who, while he wrote only three books, containing 51 chapters, on difficulty of breathing (which with him was a mere nothing), composed no fewer than 17 books, containing 198 chapters, on the subject of the pulse, of the cause of which, be it remembered, he was all the time profoundly ignorant. On the first view of these books, one is tempted to think, that among all the voluminous monuments of human frivolity, it would be difficult to find a better example of utter inanity in the same space, than these said 198 chapters of Galen afford; and it has indeed been suspected by Morgagni and others, that he must have been laughing at his readers when he composed them.

While, however, it is unfair to conclude that so great a man described differences in the pulse, which he did not *think* he had perceived, it is certain that his skill in prognosis, which has been ascribed chiefly to his excellence in this respect, was wonderful; and these books have accordingly been frequently extolled as a masterpiece, although their intricacy is such that some of his earlier followers, in despair of understanding them, were obliged to conclude that the science of the pulse was confined to God and Galen. Galen was judiciously epitomized on the subject, first by himself, and afterwards by Œtius, Egineta, and others; and it was at length settled among them that there were, upon the whole, about twenty-five varieties of pulse, with respect, 1st. to the succession of beats; 2d. to the interval between the beats; 3d. to its rhythm; 4th. to its extension; 5th. to its fulness; 6th. to its strength; 7th. to its impetus; and 8th. to its equality; in addition to many others, which were fancifully named from a resemblance to the motions of certain animals, as caprizans, formicans, vermicularis, and so forth. It was not to be expected that language should afford distinct words for each of these varieties, so that it became necessary to use the terms celer, creber, plenus, and validus, inordinatus, and inequalis, &c., in quite

* For what follows in the MSS., an abridgement of an article which appeared in the Edin. Med. and Surg. Journal for January 1842, by the Editors, upon Dr Skoda's views, has been substituted, for the same reasons as those given at p. 341.

[The semiological indications afforded by the heart, and ascertainable by auscultation, depend either on

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different senses, although to the uninitiated they convey very nearly the same idea. The Arabians, of course, followed Galen with respect to the pulse, as with respect to every thing else; and since the time of the Arabian supremacy, the sphygmical art has been lauded and magnified, chiefly by Actuarius, of chamber-pot notoriety, by Alpini, Baillon, Solano, Nihell, Bordeu, Fouquet, Buchholz, Clay, and, within these few years, by Sachero, and, though last not least, by Dr Julius Rucco, a bachelor of one thing, and professor of two things, a member of three or four things, and an author of many things, among other things, of two octavo volumes, published at London no longer ago than the year of human redemption 1827, on the pulse. These authors, in spite of the common-sense views of this subject by Floyer, Heberden, Falkener, and others, have contrived even to out-Galen Galen, and established it, that the pulse, which, abstractedly considered, may be either frequent and precipitate, or rare, quick, or slow, great and developed or small and filiform, full or empty, strong or weak, hard, dry, and resisting, or soft and supple, stretched or relaxed, free or embarrassed, superficial or deep-seated, regular or irregular, equal or unequal, double, caprizating, interceding, undulating, formicating, mouse-tail, and nobody knows what besides. Besides, in addition to all this, the pulse is susceptible of a grand division into two classes, according to the state of the body of which it is symptomatic, the one called organic, as proper to affections of particular organs, and the other called critical, as indicating an approaching critical evacuation. Of these, the former is said to be divisible into the capital, the guttural, the pectoral, and epigastric, stomachic, hepatic, splenic, abdominal, and intestinal pulses, and so forth, according to the immediate seat of the morbid affection; and the latter into superior critical and inferior critical, according as the scene of the approaching evacuation is to be above or below the diaphragm, and subdivisible into as many species as there are organs communicating with the several outlets of the body. Of some of these varieties of pulse, Gruna, in his "Simiotica Pathologica," has given fanciful diagrams or outward visible signs, intended to communicate notions verily not easily conveyed by words; and these will be found copied by Dr Buchan in his recent little work on Symptomatology. With respect to any practical advantage to be derived from this exquisite cultivation of sphygmica (as Dr Rucco chooses to call it), there can be but little

the varieties in its beat, the sounds which accompany its action, or its rhythm.

I. Varieties in its beat.

1st. The place where the beat is felt indicates the position of the heart. In the normal state the beat is felt between the cartilages of the 5th and 6th rib of the left side. The changes of position which the heart may assume are the vertical and the horizontal. In the vertical position the beat is felt at the lower part of the sternum, or even in the scrobiculus cordis. This position of the heart can only take place in pneumothorax, large exudations into the cavity of the

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doubt, that in every diseased state of every organ of the body, some peculiar stimulus is conveyed to the heart, which may, and probably does, influence in a peculiar way the action of this organ; but that such an influence (to the degree at least which has been sometimes pretended) is perceptible at the wrist, even with all the nicety of touch of which some persons affect to be possessed, and still less that these differences are communicable by any form of words hitherto in existence, "credat Judæus non ego." We know that the state of the pulse in peritonitis is very different from its state in peripneumonia; and the same cause which produces this difference may, and probably does, produce other differences with respect to the pulse in the morbid affection of every part of the body; but when we reflect how numerous these organs are, and how numerous the morbid affections of each, we may be excused from believing that there is a perfectly distinct pulse for every one of these, or, if there be (and that there is, it is perhaps not more incredible than that the same lips or the same vocal chords, transmitting the same air, should be capable of affecting the great varieties of sound which are produced in whistling or singing), still, that the tact of man is adequate to perceive, and still more that his language is adequate to describe, these differences.

It is probable that medical men in general pay too little attention to the difference of the pulse in discriminating diseases; but it is not by claiming for them too much, and that in the weak and inflated style that some recent professors of sphygmica have adopted, that such apathy is to be removed.

pleura and vesicular emphysema, involving a great part of the left lung.

The horizontal position of the heart arises from the diaphragm being thrust up into the chest by large effusions into the abdomen, distention of the intestines by gas, or enlargement of the left lobe of the liver, and in large exudations into the right cavity of the chest, which, by depressing the right lobe of the liver, push the left one into that side of the chest; or, without any change in the diaphragm, by aneurism of the ascending aorta.

2d. The force of the beat.

Minor degrees of increased strength of beat, being compatible both with health and many morbid conditions, afford no definite indication of disease; but when the beat is so strong as to raise the head of the auscultator, it indicates either hypertrophy with dilatation of both ventricles, or of the left one alone, with insufficiency of the aortic valves.

II. Sounds of the heart.

In health there is heard two distinctly different sounds, the first somewhat long and full, the second sharp and clear: these are called the tic-tac, or normal sounds. They are liable to be variously modified, or even wanting, in disease; and hence their presence, and the peculiarities they present, afford many important indications. We cannot enter into the discussion of the cause of the various sounds of the heart: it is sufficient to observe, that they depend upon various causes, but the most important one, in a practical point of view, is the action of the valves; for no change of consequence can take place in sounds of the heart without a corresponding one in the valves, and *vice versa.*

The principal point to be attended to is, that both the right and the left ventricle, the pulmonary artery and the aorta, are capable of producing independently both the sounds audible in the region of the heart; and hence the exact point of origin of the sound is of great diagnostic value.

Origin of the sounds in the different compartments of the heart.

The first sound which is heard during the systole of the ventricles arises from the interruption of the streams of blood from the shutting of the mitral and tricuspid valves, and depends upon the *columnæ carneæ* and *chordæ tendineæ* being thrown into vibration by the sudden closure—by the blood in the ventricle —of the mitral and tricuspid valves; and the reason the sound is prolonged is, that the vibration continues as long as this state of tension is maintained. In imperfection of these valves, the normal sounds are modified or altogether absent, and their place supplied by abnormal ones, which will be more particularly described in their place.

The second sound heard in the ventricle is generally merely that transmitted from the semilunar valves. In some cases, however, the second sound arises in the ventricle itself, and the cause of its origin here has not as yet been satisfactorily explained.

The first sound in the aorta and pulmonary artery is produced by the sudden tension of the coats of these vessels by the systole of the ventricles. The second sound arises from the shock of the blood upon the semilunar valves. These arterial sounds are frequently heard as far as the carotid and subclavian arteries.

Abnormal sounds.

In the place of the sounds already described as characterising the normal condition of the heart, a sound is sometimes heard of a rushing or whizzing character, resembling the blowing of bellows, filing, sawing, &c.

The causes of these abnormal sounds are,

1st. Imperfection of the semilunar, mitral, or tricuspid valves;

2d. Contraction of the left auriculo-ventricular orifice, or of the orifice of the aorta;]

3d. Roughnesses, as from excrescences, cartilaginous or calcareous concretions, or blood coagula on the endocardium towards the orifice of the aorta, on the lower surface of the semilunar valves of the aorta or pulmonary artery, or on the ventricular surface of the tricuspid and mitral valves.

It is extremely doubtful if any of the abnormal sounds above mentioned can occur without in every case some one of these organic affections being present, although they have been represented by very high authority to be sometimes produced by simply functional derangement of the heart's action.

It has been observed, that in the same case of disease of the heart the character of the sound frequently varies; and at one time a bellows, at another a sawing sound is heard, according as the action of the heart is more or less energetic; and often it is quite arbitrary how the sound is denominated, for if several observers auscultate the same case, one will compare the sound to a file, another to a bellows, &c. Dr Skoda therefore considers any subdivision of the abnormal sounds quite superfluous, and of no diagnostic

value, and comprehends them all under the general term *Geräusch,* which we have rendered abnormal sounds. The points of importance to know are, where they arise, and whether they are synchronous with the systole or diastole; for upon these conditions depends their value as diagnostic signs.

Indications afforded by the normal and abnormal sounds in the ventricles, aorta, and pulmonary arteries.

1. a. In the left ventricle during the systole.

α. The normal (first) sound indicates that the mitral valve closes, and thus prevents the influx of the blood into the auricle.

β. Bellows sound, in the place of the first normal sound, arises either from the imperfect closure of the mitral valve, or from friction of the blood on rough spots in the neighbourhood of the aortic orifice, while at the same time the mitral valve may shut perfectly, or from a combination of both these conditions; and in the first case it is caused either by the friction of the regurgitating blood upon a rough spot of the margin of the valve, or from the sudden influx of a stream of blood, driven from the ventricle, meeting one flowing in the auricle in the opposite direction.

In imperfection of the mitral valve, the pulmonary circulation is always overloaded, and obstruction afforded to the passage of the blood through the lungs; and hence follow increased action of the right heart, greater tension of the pulmonary artery, and consequently preternatural loudness of the sound of its valves, *i. e.* the second normal sound heard over the pulmonary artery. If the second sound of the pulmonary artery be not strengthened, the abnormal sound heard during the systole in the left ventricle

indicates roughness either of the surface of the valve, or of the lining membrane of the ventricle in the neighbourhood of the aortic orifice, without imperfection of the valve; for it is only here that the current of blood has sufficient velocity to cause a sound.

1. b. Sounds heard in the left ventricle during the diastole.

α. The normal (second) sound, without bellows sound, indicates that the auriculo-ventricular orifice is not contracted, and that the blood does not encounter any rough spots in its passage from the auricle to the ventricle.

β. Bellows sound, either accompanying the normal sound or alone, indicates contraction and roughness of the auriculo-ventricular orifice, with rough and projecting spots upon the auricular surface of the valve, without narrowing of the orifice. When this contraction is considerable, the passage of the blood gives rise to that thrilling sensation felt over the region of the heart, called by Laennec "fremissement cataire."

2. a. In the right ventricle during the systole.

α. The normal (first) sound, without bellows sound, indicates that the tricuspid closes perfectly, and prevents the reflux of blood into the auricle.

β. Bellows sound alone, or accompanying the normal sound, indicates either imperfection of the tricuspid valve, with rough spots on its free edge, or excrescences in the neighbourhood of the arterial orifice, while the valve closes perfectly.

Imperfection of the tricuspid valve causes accumulation of blood in the auricle, venæ cavæ, and jugular veins, increased at each systole of the ventricle, and hence arises the pulsation of the jugular veins.

3. a. Sounds heard in the aorta during the systole of the heart.

α. The normal (first) sound, without bellows sound, does not necessarily indicate a perfectly normal condition of the aorta, for it may be present in various abnormal states of that vessel, such as alteration in its capacity, or thickening of its coats, which may influence the intensity of the sounds without affecting their character.

β. Bellows sound with or without the normal sound indicates rough spots on the inner surface of the aorta, or on the under surface of the semilunar valve. But in chlorotic persons the vibrations in the carotid and subclavian arteries may be sometimes propagated down to the aorta, and thus a dull abnormal sound heard without there being any roughness present.

2. b. Sounds heard in the aorta during the diastole of the ventricles.

α. The normal (second) sound, without bellows sound, indicates the closure of the aortic valves.

β. Bellows sound, in the place of the normal sound, when prolonged and heard beyond the base of the heart, indicates imperfection of the aortic valves, with rough spots on their free edges.

γ. Bellows sound ending in a normal sound arises from the presence of rough spots on the inner surface of the aorta, while at the same time the aortic valves close perfectly.

4. a. Abnormal sounds occur rarely or never in the pulmonary artery.

III. The rhythm of the beat of the heart is subject to many irregularities, which undoubtedly frequently arise from organic changes in the heart itself. It is

certain, however, that the greatest irregularity in the rhythm of the sounds and beat of the heart may coexist with an apparently perfectly normal condition of that organ; and, on the other hand, there is scarcely any organic change in the heart and its valves incompatible with perfect regularity of its rhythm. Hence irregularity of the rhythm of the heart, however great it may be, cannot afford ground for concluding that organic disease of the heart is present.

Besides the heart, the pericardium also may in disease be the seat of certain abnormal sounds, by the classification and study of which it was hoped that important diagnostic signs for the diseases of that organ would have been obtained. Later experience however has shown that sounds precisely similar to those produced in the pericardium may arise also within the heart; while, on the other hand, all the sounds that occur in the heart, except the whistling sound, may be exactly imitated by pericardial sounds. The circumstance, too, of the sound being more superficial or remote, is no ground of distinction, for a sound propagated through solid bodies appears quite superficial when it is loud, and *vice versa;* and thus a very loud bellows sound in the heart often appears quite superficial, while a pericardial one is often weak and dull, and therefore appears to come from a distance. The only direction that can be given for distinguishing them is, that the abnormal sounds *within the heart* follow exactly the rhythm of the beat, thus corresponding to the normal sounds, while *those in the pericardium* appear somewhat postponed.—(Nachschleppend.)—(EDITORS.)

CHAP. VI.

DIGESTION.

STRICTURE AND PALSY OF GULLET—HYDROPHOBIA—DYSPEPSIA—CONSTIPATION—TOO LIQUID STOOLS—CHANGES IN THE URINE—GENERATION—AMENORRHŒA—CHLOROSIS.

To the function of *digestion*, as displaying inordinate phenomena in disease, belong difficulty of swallowing, rumination and eructation, vomiting, preternatural constipation, too frequent or too copious stools, and flatulence, all which must arise from some fault in either the irritability of the parts concerned, the stimulus by which this is excited, or their organic condition. A difficulty of swallowing may be occasioned by either (the idea of any change in the irritability of the organs concerned being quite gratuitous) an inordinate degree of that stimulus which is naturally derived from the brain (as in spasm of the gullet, analogous to angina pectoris), sympathy with some organ in a state of irregularly renewed irritation (as in hydrophobia, analogous to pertussis or palpitation), a defective conveyance of the accustomed stimulus of healthy sympathy with the rest of the body, by the glosso-pharyngeal and trisplanchnic nerves (as in what is called palsy of the passage, analogous to asthma or syncope), or some mechanical obstruction

of the gullet (as in numerous organic diseases). In the first of these cases, or spasm of the gullet, liquids will of course be more easily swallowed than solids, partly from the less additional stimulus which they afford, and partly from their requiring a smaller space in the gullet for their passage; while in palsy of the gullet, for opposite reasons, solids will be more easily swallowed than liquids, as they not only afford a greater stimulus, but require less contraction. In hydrophobia the same is also the case, owing apparently to the minor degree of contraction, which they call for, being less prone to go on to those violent convulsions of the pharynx and gullet, in which this disease appears essentially to consist; and it is from the consciousness of the liability of these convulsions to be excited by the strong contractions required in swallowing liquids that the horror of them arises. With respect to the proximate cause of hydrophobia, it has been very generally described to consist essentially in a spasmodic or convulsive affection of the pharynx and gullet: but some authors, as Morgagni, have represented it as an inflammation of the brain; others, as Rush, of the pharynx, gullet, and stomach; others, as Fothergill, Ferrier, Trolliet, St Martin, &c. of the air-passages; others, as Marochetti, as a vesicular eruption of the mucous membrane of the mouth; and others, lastly, as Salin and Reid, as an inflammation of the spinal marrow; all the proper symptoms of this disease being supposed to be merely indicative of one or other of these as the primary affection. But encephalitis, cynanche pharyngea, and inflammation of the gullet, laryngitis, and other inflammations of the air-passages, aphtha, and mye-

litis, do never, as arising from common causes, produce hydrophobia, any more than bronchitis, arising from common causes, produces aphtha or pertussis; and if in all these cases we are compelled to admit a specific cause, it is certainly most reasonable to assume as its direct effect, and as constituting therefore the essence of the disease, those phenomena which are the most immediate and most remarkable, viz. in asthma the diminished action of the respiratory muscles, in pertussis the inordinate irritation of the larynx, and in hydrophobia the aforesaid convulsions of the pharynx and gullet, and to regard the organic diseases which frequently attend these affections as their consequences rather than their causes; and this the more especially, when the frequent absence of fever, and the usual inefficacy of all remedies commonly most effectual in the several diseases in question, are taken into consideration. It is hardly necessary to remark, that, by Gerard, Simon, and White, it is denied that hydrophobia is a specific disease at all; all its symptoms being ascribed to a modification of tetanus or hysteria. The mechanical causes of difficulty of swallowing occur principally in laryngitis, ossification of the larynx, aneurism of the arch of the aorta, bronchocele, cynanche pharyngea, and inflammation, permanent stricture, scirrhus, polypi, &c. of the gullet, as well as in cynanche tonsillaris, or any other tumours of either the soft parts or of the bones, pressing the gullet from without.

Rumination and eructation are indicative chiefly of dyspepsia, and appear to arise from the preternaturally retained aliment, and the gases formed from it, operating at length as an inordinate stimulus to the sto-

mach, and exciting in it an inverted action, upon which these motions depend. Concerning the nature of dyspepsia, authors have in general agreed in considering it a disease of diminished action of the stomach; but some, deceived by the violence with which these actions are sometimes affected in dyspepsia, have referred it rather to a deficiency or vitiation of the gastric fluid, of the existence of which there is neither evidence nor probability. By the Broussaists it is considered synonymous almost with gastro-enteritis, but apparently with no better reason than we should consider asthma or pertussis as synonymous with bronchitis, or hydrophobia with pharyngitis, &c.; the functional affections being in all these cases rather the cause of the organic changes than either identical with them or the effect of them.*

Dyspepsia unquestionably stands in the same relation to the muscular coat of the stomach, as asthma does to the respiratory muscles, or syncope to the heart; and upon the principle of all diminished action of this coat (produced probably by the minor sympathetic stimulus exercised on this organ by the rest of the body, or the inadequate conveyance of this requisite stimulus by the nervus vagus), the influence

* The presumption of Dr James Johnstone, that dyspepsia consists in a morbid sensibility of the stomach (by which he evidently means irritability) is quite gratuitous; and as to the opinion of Dr Ewings (another London author who has written upon this patient-decoying subject), that it consists primarily of muscular spasm, membranous irritation, and nervous uneasiness, it unluckily displays too much observational sinisterity, ratiocinatorial impotence, and phraseological unintelligibility to be made any thing of, and is one of the best examples of the substitution of words for ideas even in the fruitful field of pathology.

of all the causes which give rise to the disease, the origin of all the symptoms which attend it, and the good effect of all the remedies employed in its removal, are very easily explained. When, however, the inordinate stimulus of the stomach is intense, as occurs sometimes in dyspepsia, and always in cholera, pyrosis, hæmatemesis, &c. in which preternatural fluids are then deposited, or when a new stimulus is added, as in gastro-enteritis and gastrodynia (spasm of muscular coat), it calls into play, by sympathy, the diaphragm and abdominal muscles, and vomiting is the result; and the same is the case in many primary affections of many distant organs, owing to the immediate sympathy of the stomach with these. It is thus that we must explain the recurrence of this symptom in many preternatural affections of the spleen, liver, intestines, kidney, uterus, skin, &c. particularly in splenitis, hepatitis, calculi of the gall-ducts, intestinal calculi, strangulated intus-susception, strangulated hernia, nephritis, hysteritis, and the first stage of fevers: it is no more remarkable than cough and changes of the pulse from the same cause. The vomiting, which is symptomatic of stricture and scirrhus of the pylorus, seems to arise principally from a mechanical retention of the chyme for a longer than its accustomed time, and that which is symptomatic of the close of a paroxysm of pertussis, partly perhaps from the morbid irritation of the larynx and fauces, by which the paroxysm is excited, communicated first to the stomach and then to the necessary muscles by sympathy, but chiefly perhaps from the immediate irritation of the stomach by the continual violent action of the abdominal muscles, communicated in turn

to these and the other necessary muscles by the sympathy just mentioned. The appearance of the matters passed by vomiting may be either that of crude alimentary substances, or mucilaginous (sometimes however so changed as to resemble coffee-grounds), bilious, watery, fæculent, bloody, purulent, &c. according to the nature of the affection whence it proceeds.

With respect to constipation, it may arise from the stools being either defectively secreted, or voided with difficulty. Of the former we have examples in that which attends the first stage of fevers, apoplexy, and many other diseases of the brain, and also tetanus, as well as in that which attends dyspepsia, general dropsy, and diabetes; and of the latter, in that which attends stricture or scirrhus of any part of the intestinal canal, strangulated intus-susception, strangulated hernia, colic, and spasm of the sphincter ani, as well as in that which often attends paraplegia from the loss of power in the abdominal muscles. On the latter head of the causes of constipation it is unnecessary to dwell; and all those referrible to the former may perhaps be attributed to a want of the accustomed stimulus, either from the brain or from the other organs of the body, in the way of healthy sympathy.

The diminished action of the stomach in dyspepsia, and of the affected organs in dropsies and diabetes, operates in withholding from the intestinal canal that natural stimulus to which they are accustomed; and it is upon this principle that we must explain, not only constipation, but the diminution of all the other secretions of the body which attends these two diseases. If a suppressed discharge in one place, imply-

ing too great irritation, excites increased discharges elsewhere, by exciting increased action, which is speedily followed by proportionate collapse, as has been shewn while speaking of vicarious discharges in general, as well as when speaking of critical discharges and of metastasis, we should *a priori* expect that an increased discharge in one place, implying diminished irritation, should diminish those in others by occasioning diminished action, followed in like manner by an accumulation of irritability, and consequently increased action, as from the action of cold and other negative agents; and this is precisely what occurs in the two diseases in question, so that the doctrines before advocated reciprocally support and are supported by the one now inculcated. The healthy action of all the organs is more or less essential to that of each individual. If too great, the stimulus of sympathy produces too great action elsewhere; if too little (and all increased secretion implies too little action), too little action elsewhere: in both cases the consequences of these are what become principally displayed. We have elsewhere mentioned that costiveness is quite compatible with a regular stool, or even with more than one daily, since it is quite possible that what is voided to-day should have been voided yesterday, and the intestines thus continually contain the product of three or four meals more than they should do. Hence the appearance of the stools is always to be regarded. Opposed to constipation is the too frequent or too copious discharge of stools and intestinal gases (the latter producing in their passage what are called borborigmi), which may depend either on these matters being secreted in excess

or defectively retained. Of the former we have examples in the looseness which attends intestinal worms, tabes mesenterica, blennorrhœa of the intestines, colliquation, as well as in the flatulence which succeeds a paroxysm of hysteria; and of the latter, in the looseness which arises in the last stages of debility, and in palsy in the sphincter ani, as well as in that which often attends myelitis, from the excessive action in the muscles by which the stools are voided. The increased secretion of the stools and intestinal gases may be attributed to an inordinate stimulus derived from the brain, and from some other organs, in the way of sympathy, or from preternatural matters contained. The appearance of solid or liquid matters will of course be various, as simply fæculent, milky, mixed with worms, purulent, mucilaginous, bilious, bloody, &c. in the various affections in which they arise. In stricture or scirrhus of the colon or rectum, hypertrophy of the prostate gland, and spasm of the sphincter ani, the stools have generally the form of a cord or a ribbon, from the compression which they suffer during their excretion.

With respect to the functions of the urinary organs, as displaying inordinate phenomena in disease, the chief symptoms to be noticed, are the inordinately small quantity of urine secreted, as in the cold stage of fever, and in general dropsies; and its inordinately large quantity, as after a paroxysm of asthma or hysteria. The diminished secretion in the cold stage of fever obviously arises from the preternatural constriction of the capillary renal arteries, from their sympathy with those of the skin; and to the same cause to which we attributed the constipation arising in

dropsies, has been referred the diminished secretion in this disease, namely, the abstraction from the kidneys of a portion of their ordinary stimulus, owing to the diminished irritation of a distant part.* The increased secretion of urine, which frequently follows a paroxysm of asthma or hysteria, appears to arise from a new sympathetic irritation of the renal arteries, succeeded rapidly by collapse,—a critical discharge. But besides the diminished or increased secretion of the urine, a preternaturally continued retention of this fluid, its interrupted current when periodically voided, or its constant and involuntary flow, are all occasionally symptomatic of various diseases. Of these, the first arises generally either from some mechanical impediment, as in cystitis, hypertrophy of the prostate gland, retroversion of the uterus, &c. and spasm of the sphincter vesicæ, or the other muscles compressing the urethra, as in spasmodic ischuria; or from a loss of muscular power in the parts employed in voiding the urine, as in paraplegia. The interrupted flow of the urine arises generally from a stricture of the urethra, or a calculus

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* It seems at first inconsistent to ascribe a diminution of the secretions, in the one case to an increased, and in the other to a diminished stimulus, to a new sympathy in the former, and to the abstraction of an old one in the latter; but it is no more so than to ascribe inflammation at one time to heat, and at another time to cold. The effect of each of these in producing this state we have elsewhere endeavoured fully to explain; and a similar explanation may be easily applied to the subject in question. The only difference is, that, in producing inflammation, the positive agent, heat, acts at one remove, and the negative one, cold, at two; whereas, in producing the effect before us, the positive agent, sympathy, acts directly, and the negative one, the want of it, at only one remove—probably because constantly applied.

either in this passage or in the urinary bladder, the effect of either of which may be to render the current of the urine forked or spiral. Lastly, the inconstant and involuntary flow of this fluid may arise from either an ulcer of the neck of the urinary bladder, or a loss of muscular action in its sphincter, as occurs in the last stage of typhus fever, and in the proper palsy of this muscle. In addition to all this, the urine voided may be very various in its appearance, as has been already observed, containing mucilage, as in catarrh of the urinary bladder or other passages, or blood and pus, as from a calculus in these organs; or there may be a discharge, more or less constant, of mucilage, pure or vitiated, as in gonorrhœa.

With respect to generation, this function, which, unlike those hitherto spoken of, is exercised only periodically, does not display any inordinate phenomena of disease distinct from the desire of venery and the act of copulation, the former of which, as belonging to sensation, and the latter to muscular motion, must be for the present deferred. Of the fluids however connected with this function, the secretion of the menstrual fluid may be suppressed, as in general dropsy, diabetes, &c. for the same reasons as the stools (and in the former the urine), as well as in that form of dyspepsia called chlorosis, owing to a want of a proper sympathetic irritation of the uterine arteries from the stomach, the action of which is so much below par. It is usual to regard the dyspeptic symptoms as symptomatic of the suppression of the menstrual discharge; but the reverse is much more probably the case, 1st. because a primary failure of any of the natural secretions rarely if ever happens; 2d. because when a

failure of the menstrual secretion takes place, as a symptom of dropsy, we do not ascribe the dropsy to the amenorrhœa, but the amenorrhœa to the dropsy; and, 3d. because, under these circumstances, such a failure does not give rise to dyspeptic symptoms. By the Broussaists, chlorosis is properly identified with dyspepsia. The discharge of the lochia likewise is suppressed generally in the puerperal peritonitis, and always in hysteritis; in the former for the same reason that the stools, urine, &c. are suppressed in the first stage of fevers in general, and in the latter, not only on account of this general constriction of all the capillary arteries of the body, but on account of the particular constriction of those of the mucous membrane of the uterus previously to their becoming inordinately dilated. The secretion of milk also is commonly suppressed in both. Other discharges also may take place from the vagina, as of mucilage, pure or vitiated, in inflammation of this organ; of air, in physometra; of sanies, in cancer of the uterus; and so forth.

CHAP. VII.

SENSATIONS.

AFFECTIONS OF SIGHT—WANT OF APPETITE—UNEASY SENSATIONS—TOO ACUTE SENSIBILITY—APOPLEXY—MUSCÆ VOLITANTES—TINNITUS AURIUM—TASTE—FORMICATION—AURA EPILEPTICA—ITCHING—NAUSEA—HEARTBURN—STITCH—TENESMUS—STRANGURY—ANXIETY—PAIN.

We proceed now to speak of the peculiarities in the several *sensations*, in as far as these are symptomatic of various diseases; and under this head we shall treat shortly, first, of the irregularities of the natural sensations, and then of such sensations as are altogether preternatural. Now, as every sensation depends upon some primary irritation conveyed by sensific nerves to the seat of sensibility, it follows that every modification of it must arise from some peculiarity in either this primary irritation, the sensific nerves by which it is conveyed to the seat of sensibility, or the sensorium itself. The primary *irritations* from which most of the sensations, as smell, sight, sound, and taste, arise, depending usually upon stimuli which are exterior to the body, any deficiency of these cannot be productive of uneasiness; nor can their excess be considered morbid, so long as they are only proportionate to the degree of stimuli applied. Sometimes however the character of such stimuli, and consequently of the primary irritation, is more or less mo-

dified by the physical condition of the percipient organ, as when, with respect to sight, the rays of light take a green tinge, as in jaundice, or a blue tinge, as in glaucoma, owing to the changed colour of the humours of the eye; or when all objects appear more or less red, as after several narcotic poisons, owing to the preternatural quantity of blood in the several parts of the eye, to be traversed by the rays of light before they impinge upon the retina. We might speak here also of the various illusions under which each of these senses, and in particular the sight and hearing, occasionally *appear* to labour; but as these illusions are not of sensation, but of thought, and do not consequently depend on any preternatural irritation of the immediate organs of the senses, we shall defer their consideration for the present. But besides these irritations, depending generally on stimuli from without, others directly depend upon stimuli from within, and consist exclusively in peculiar conditions of certain organs, such as those which excite hunger, thirst, the sensation producing the desire of venery, that producing the desire of exertion, &c. and of course any deficiency or excess of these irritations, belong naturally to this place. The principal cause of uneasy sensations, however, is not the want or excess of natural irritations, but the presence of such as are preternatural; and it is accordingly to this head that the greater number of uneasy sensations which characterize various diseases is to be referred. The condition of the *sensific nerves*, which have been elsewhere described as being mere conduits, can operate in giving rise to uneasy sensations only negatively; but the sensibility itself, as seated in the sensorium, may be

either too acute or too obtuse, and in either way give rise to uneasy sensations. Among the uneasy sensations, then, which appear to depend upon the want of some accustomed irritation, are those from which proceed a want of appetite (the want of thirst being hardly to be called an annoyance), deficient desire of venery, languor, and debility. As hunger has been presumed to depend upon a certain state of tension of the stomach, the sensations producing a desire of venery upon a similar state of the genital organs, and the sensation of alacrity and vigour, whence arises a desire of exertion, upon a similar state of the muscles of voluntary motion, it is fair to conclude that the uneasy sensations just mentioned arise from a preternatural relaxation of these organs, owing to a deficiency of some accustomed stimulus, such as that of a healthy sympathy with other organs defectively conveyed, as in dyspepsia, or that which in health is continually derived from the brain. In the case of uneasy sensations, giving rise to want of desire of venery, however, it often arises probably from a diminution in the healthy secretions of the genital organs. The uneasy sensation producing want of appetite, languor, and debility, occur in a greater or less degree in almost all diseases, but particularly in the first and last stages of fever; in the former apparently from the accumulation of the blood in the larger vessels of the body, so that all the secretions affected by the capillary vessels are diminished; and in the latter, from the diminished energy with which secretion in general, as well as all the other functions, is performed, owing to the previous inordinate excitement. The same uneasy sensations are very remarkable also in scor-

butus, in morbus cæruleus, and in dyspepsia, to omit sanguineous apoplexy and palsy, in which this relaxation of the muscles of voluntary motion is entire. The uneasy sensation giving rise to the want of a desire of venery is in general very remarkable in diabetes, for sufficiently obvious reasons.

We must not leave this subject without making one remark, which to some may savour of unnecessary subtilty, but which is quite necessary to the full comprehension of the subject under consideration, viz. that we must constantly distinguish in those cases the sensations producing the desires from the desires themselves. The seat of sensation is in certain parts of the spinal marrow, that of desire (a modification of thought) in the brain. It is true, the desires arising from sensation are instinctive, not reasonable; they consist in a blind impulse, over which we have no control, but they are not the less on this account situated in the brain; and it is only by keeping this constantly in view that we can have any but the most vague and confused ideas how the desires just alluded to, whether defective or excessive, may be, and often are, dependent upon the greater or less excitement of certain parts of the brain, and without any connection whatever with the several sensations whence they usually arise. This subject, however, like the illusions of the senses lately mentioned, belongs to the head of perturbed thought, and not of perturbed sensation.

With respect to the irregularities of the natural sensations in general arising from either too acute or too obtuse a degree of sensibility, it is sufficiently well known, that the senses are for the most part too

acute in the second stage of fever, in myelitis, and in arachnitis of the surface of the brain; whereas they are for the most part preternaturally obtuse in the first stage of fevers, in arachnitis of the ventricles of the brain, in encephalitis, and in apoplexy. The reason of all this will be sufficiently obvious, if we reflect that the seat of sensibility is in all probability the gray matter of the posterior column of the spinal marrow, with which the lobulated surface of the brain is directly continuous; and that the deposition of this gray matter is probably always in proportion to the quantity of blood contained at any given time in its capillary arteries. Hence we have endeavoured elsewhere to establish it, that the proximate cause of sleep, in which all the senses are more or less entirely suspended, is a more or less perfect exclusion of blood from these capillary arteries, so that that state in which there is obviously an accumulation of blood, might *a priori* be expected to give rise to a preternatural acuteness of all the senses.

This, then, sufficiently explains why the senses should be preternaturally acute in the second stage of fever, in which the capillary arteries of the gray matter of the brain, sympathising with those of the skin, have become dilated, as well as in myelitis, and arachnitis of the surface of the brain; and the same doctrine may be easily applied to explain the hebetude of the senses which occurs in the first stage of fevers, in which the capillary arteries of the gray matter of the brain, like those of the skin, are still constricted, as well as in nervous apoplexy, or that state of the brain which is produced by strong drink, violent passions, a blow on the head, intense cold, a

stroke of lightning, narcotic poisons, certain contagions, &c. all which give rise to the symptoms of apoplexy, without offering after death any marks of disease.

The same thing occurs also in arachnitis of the ventricles, encephalitis, and sanguineous apoplexy, in all which there is an accumulation of blood, either extravasated or still in its vessels, about the figurate surface or central parts of the brain, the necessary effect of which must be pressure exercised upon the convoluted surface, to exclude the blood to a greater or less degree from the capillary arteries of this part, and thus to produce, by pressure from the centre (greater perhaps from being now interstitial), the same or even a greater effect as pressure from the surface (such as occurs from depression of the skull) is so well known to occasion.

With respect to the manner in which extravasated blood produces sanguineous apoplexy, it has in general been supposed to do so by its pressure; and this view is supported by the fact, that such pressure by any other means commonly occasions similar symptoms, as is particularly illustrated by the well-known story related by Haller, of the Parisian beggar, who having lost a portion of his skull-cap, could, by pressure upon the brain with his fingers, render himself apoplectic at will; as well as by the history of similar experiments performed on the lower animals by Portal, Sir A. Cooper, and others. Such pressure is supposed by Abercrombie to operate in producing sanguineous apoplexy, not directly, but by impeding the course of blood by the veins of the parts, so that the corresponding arteries becoming overloaded, produce by their distention all the symptoms of the

disease; and that it is in all cases from this distention of the arteries, and not from any extravasation of blood, that apoplexy proceeds. It had indeed been before noticed by Morgagni, Vater, Scarpa, Baillie, Hodgson, Cheyne, and others, as it has since by Bouillaud, that some change in the minute arteries of the parts concerned always precedes sanguineous apoplexy; but such a distention of the arteries as is assumed by Abercrombie as the proximate cause of apoplexy, constitutes inflammation, and inflammation of the brain is encephalitis, and not the disease in question, although such inflammation often precedes apoplexy, and even of itself offers many similar symptoms. Dr Abercrombie seems to be in fault in calling that apoplexy, which is in reality only a precursory affection, in the same way as Whyte and others were in calling that hydrocephalus which was in reality only arachnitis; but his theory of the exciting causes may nevertheless be substantially true, and it perhaps furnishes the best explanation of the cases recorded by Gooch, Magnet, and others, as well as of the experiments made by Serres, proving that considerable *general* compression of the brain does not always produce apoplexy, since it may be presumed that when such is the case, the compression operates equally upon both arteries and veins; so that if it prevent the return of the blood by the latter, it prevents in the same degree the filling of the former, and consequently the interstitial deposit which would result from it.

Besides the diseases already mentioned, in which the senses are either preternaturally acute or obtuse, there are one or two other states in which these phe-

nomena display themselves. One of these is animal magnetism, to which we have already alluded as capable of increasing in a remarkable degree the acuteness of sensation, or of altogether suspending it, according as it is administered, either moderately to excite the brain, and thus to produce a state analogous to arachnitis of the surface, or intensely to excite the brain, and thus to produce a state analogous to trance or ecstacy, in which the brain, absorbed in its own proper function, ceases to receive any impression from without. The same is the case also in a paroxysm of mania, during which, it is well known, all the nerves become hepatized. Vertigo, or swimming in the head, consists in an alternate failure and renewal of sensibility, &c. from rapid motion, and before and after coma.

It seems unnecessary to dwell any longer upon the irregularities of the natural sensations, since the greater number of these rather constitute distinct diseases than are merely symptomatic of them; and when otherwise, they have for the most part been already alluded to under the head of the several senses under which they arise. We shall proceed, therefore, to notice a few of the most preternatural sensations which are symptomatic of diseases, and to give the best rationale of them in our power.

With respect to the sight, then, a very common and a very annoying sensation in many diseases, quite distinct, as well from a generally changed colour of objects, as from optical illusions, is that called "muscæ volitantes," consisting in the glittering images of minute objects continually flitting like spangles before the eyes. It is symptomatic of many diseases of the

brain and other parts, as apoplexy, epilepsy, hysteria, &c. pretty obviously arising, not from a greater accumulation of blood in the parts of the eye traversed by the rays of light, which would serve only to turn these rays red, but from some irregularity in the circulation of the blood through the minute arteries in the neighbourhood of the retina; so that an irritation commonly excited by rays of light alone is now excited by a mechanical cause, giving rise to the only sensation (that of sight) which this nerve is capable of communicating; and that this is the cause of the sensation in question, is pretty evident from the fact, that it may always be produced by any circumstances calculated to disturb the circulation through the head, such as rapidly shifting this from the erect to the depending posture, and *vice versa*. Analogous to this sensation with respect to sight, is the preternatural sensation of "tinnitus aurium." With respect to hearing, and quite independent of acoustic illusions, consisting in the continual sounds, as the ringing of bells, the flow of waters, &c. symptomatic of precisely the same diseases as muscæ volitantes, we can have little hesitation in referring this preternatural sensation to some irregularity in the circulation in the immediate vicinity of the auditory nerve, more especially as it may be excited by exactly the same means as muscæ volitantes.

With respect to taste, a bad taste seems generally to arise from some vitiation of the mucilage of the mouth, or of the other secretions poured into this organ. It is accordingly symptomatic of dyspepsia and fevers in general, in the course of which the mucilage of the whole intestinal canal undergoes such remarkable

changes; as well as of ptyalism, by which not only the quantity, but the quality, of the saliva is frequently so much changed. The bad taste in icterus evidently arises from the admixture of bile with the natural secretions of the mouth.

With respect to the touch, the singular sensation called formication, or tickling, appears to be strictly analogous in its nature to those already mentioned under the names of muscæ volitantes and tinnitus aurium, and to arise from some irregularity in the circulation of the blood through the capillary arteries in immediate contact with the sensific nerves of the skin; so that the same irritation, which, in the cases already mentioned, could produce only an impression of sight or sound from the character of the nerve by which it was conveyed, produces now from the same cause an impression of touch. Formication is common in parts which have been exposed to great cold (by the re-action succeeding which the capillary arteries have been contracted) on the application to the parts of heat (by the collapse succeeding which they are too much expanded), when a slight accumulation of blood takes place in them, sufficient to excite the sensation in question, but not (as in inflammation) to excite pain. The same sensation commonly attends the transition of intermittent fevers from the cold stage to the hot, and is common in lichen, urticaria, erysipelas, and other inflammatory diseases of the skin, previous to the full formation of the eruption. The cause of it in both these instances is evidently the same as in the instance above mentioned. But it is not in inflammatory diseases only that this sensation arises, since it is a common attendant also on

palsy, particularly in that form of the disease called barbiers. In these cases it apparently arises from the stimulus naturally derived from the brain being no longer sufficient to promote the regular contraction of the capillary arteries of the part affected, so that some slight accumulation of blood takes place in them; and that this is the true explanation of formication in these cases, is probable, from this sensation being common in that state of a limb frequently called sleep, which is produced by a continued pressure of its principal nerves.

One of the most remarkable examples of formication is the sensation called aura epileptica, a common antecedent of an epileptic paroxysm, and susceptible apparently of a precisely similar explanation. In this disease the natural stimulus of the brain to the other parts of the body is obviously diminished; and it is fair to conceive that it will be abstracted, first, from those organs which are most distant from the heart, and progressively from those which are nearer and nearer to it. It is accordingly generally at the extremities of the limbs that this aura epileptica, excited by slight accumulations of blood in the capillary arteries of those parts, commonly begins, extending progressively along the skin, the sensific nerves of which alone are capable of taking cognizance of this slight irritation till it reaches the head, when at length the paroxysm of epilepsy comes on. In confirmation of this view it may be mentioned, that a total removal of almost any organ from the influence of the brain is a very common cause, not of formication only, but even of inflammation, as after division of the fifth pair of the eye, nostrils, gums, and, after a complete pa-

raplegia, inflammation of the bladder. The preternatural sensation called setting the teeth on edge, to which we have before alluded when speaking of the sympathy between the mouth and ears, is hardly to be considered as symptomatic of disease; but it pretty certainly has its origin in the same cause to which we have just ascribed formication, namely, an inequality in the circulation through the capillary arteries in the neighbourhood of the sensific nerves of the gums, and accordingly, if intense, sometimes goes on to hæmorrhage. Of the same nature also seems an uneasy sensation in the larynx, exciting a desire to cough; and of this any one may satisfy himself by repressing the cough for some time, when the tickling in the part becomes perfectly intolerable. It appears to be relieved by coughing, from the strong stimulus afforded by the suddenly expired air, in the same way as formication of the surface of the body is relieved by friction.

The sensation called itching, equally connected with the sense of touch, appears to arise from some acrimony in the secretion of the integuments; and it accordingly occurs principally in prurigo, herpes, and other diseases of the skin, not, like formication, in the *beginning* of these diseases, but chiefly at their *close*, when the inflammation has already proceeded to increased secretion: it is hence a familiar remark, that a superficial sore of any kind is getting well when it begins to itch. This sensation is common also over the whole surface in jaundice, when the cause of it is evidently what has just been mentioned; and the only reason why the vitiated secretions of the surface produce itching, while those of the mucous membrane of the mouth

produce a bad taste, seems to be the peculiar character of the nerves of the respective parts, or rather of the organization of the papillæ upon which the nerves are distributed. A similar explanation may be given of the itching felt about the nostrils and anus from intestinal worms, as well as about the extremity of the urethra when there is a calculus in the bladder. In these cases the secretions of the whole of the passages may be presumed to be vitiated, but it is only when these passages approach the surface that the sensific nerves are sufficiently numerous to take cognizance of the irritation so produced. It is singular that a similar itching of the nostrils often attends the passage of a gall-stone into the duodenum. With respect to the preternatural sensations connected with the sense of touch, and confined to individual internal organs, they consist principally of nausea, cardialgia, the uneasy sensation called stitch, tenesmus, and strangury. Of these, the first appears to arise from a preternatural constriction of the capillary arteries of the stomach,—the first effect of all those stimuli, whether direct or sympathetic, which have been already enumerated as exciting vomiting. Of this we have a very satisfactory proof during the operation of an ordinary emetic, the effect of which, previously to its increasing the secretions of the stomach, by dilating its capillary arteries, is certainly to contract them; and as it is from the former effect that vomiting results, so it is during the latter that we experience the sensation of nausea. It is from this cause also that nausea arises in the cold stage of an intermittent fever, during which the capillary arteries of the skin are obviously constricted; and, as has been already frequently observed, such is the intimate

sympathy between the vessels of the skin, stomach, and surface of the brain, that, from knowing the condition of any one of these parts, we may generally infer that of those of either of the others. Thus, while during the cold stage of an intermittent fever, when the skin is constricted and pale, there is commonly nausea, so, when an emetic is beginning to operate, the skin is commonly constricted and pale; whereas, while in the hot stage of such a fever, when the skin is red and tumid, vomiting is not an uncommon symptom, so, during the full operation of an emetic, redness and tumefaction of the skin are almost constantly observed: but as, in the former case, the senses and intellectual faculties are always much below par, so in the latter they are always considerably elevated. It is hardly necessary to say that nausea usually precedes vomiting in the numerous affections of which the latter is symptomatic. Dr Holland is of opinion, that all the causes which excite nausea operate primarily by exciting an overcharged state of the lungs, by increasing the proportions of the inspirations to the expirations; and there is no question that, during the constricted state of the surface which always attends nausea, there is always this preponderance of inspiration; but he certainly errs in calling this state of the lungs the proximate cause of nausea, of which it is rather the effect (and that only at one remove) than the cause. Cardialgia or heartburn is evidently occasioned by the development, in the secretions of the stomach, of a preternatural quantity of acid, generally perhaps the muriatic;* thus differing

* [Prout and Children found free muriatic acid in the matters vomited by dyspeptic persons (Stark, Allgemeine Pathologie, bd. ii.

from thirst, with respect to its immediate cause, only in the kind of vitiation which these secretions undergo. It is an attendant principally upon pyrosis and dyspepsia. The uneasy sensation called a stitch seems to arise from the spasmodic contraction of a few fibres of the diaphragm, and to be analogous, on the one hand, to a gape and hiccough, the former of which has been already described as a kind of convulsion, and the latter as a momentary spasm of this organ; and on the other, to angina pectoris, which has been already represented, after Dr Darwin, to consist in a spasmodic contraction of the diaphragm, and to differ from a stitch therefore only in being more intense, and involving a greater number of its fibres. The ordinary cause of a stitch is, accordingly, in boys, precisely that which in middle-aged men is accustomed to produce angina pectoris, viz. violent exercise, as in running or walking, such as may be presumed to call the diaphragm into preternatural action; and, as a symptom of disease, the same affection is met with principally in rheumatism and other affections of this organ, as well as in some diseases of the liver and stomach, in which it appears to be preternaturally irritated. This sensation is usually supposed to arise from an over-distention of the spleen by blood; and it was on this account that the ancient Romans were accustomed, it is said, to extirpate the spleen in their athletæ, in order that their speed might not be diminished by its occurrence: but as an over-disten-

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p. 581). In Blainville and Meyer's experiments, cutting the par vagum was followed by increased acidity of the gastric juice (Burdach's Physiologie, bd. v. p. 492).]—Editors.

tion of the spleen may certainly (as in the cold stage of an intermittent fever, or even after a full meal) take place without a stitch, and as this takes place not less frequently on the right side than on the left, we seem justified in believing that the spleen has nothing to do with it; and that its real cause is that which we have above supposed, is rendered probable, not only by a consideration of its usually exciting causes, and of the diseases in which it commonly occurs, but also from the peculiar character of the sensation on its departure, which frequently gives us the impression of something having suddenly given way, as well as by the relief we usually experience from medicines calculated to relax spasms in other parts.

The uneasy sensation called tenesmus, consisting in a frequent desire to void the stools at a time when there is no accumulation of them in the rectum, seems to arise from one of the causes, either from a preternatural compression of this intestine, from some substance in the neighbourhood operating almost in the same manner as an accumulation of the stools, or some inequality in the circulation of the blood in its capillary arteries, giving rise to an irritation, which, conveyed by the sensific nerves of the part, occasions the only kind of sensation which these nerves are capable of communicating. In this view of the matter, tenesmus is with respect to the rectum precisely what muscæ volitantes, tinnitus aurium, and formication, are with respect to the eyes, ears, and skin, each of these being capable of being excited as well by mechanical causes as by an inequality in the circulation of the blood through the respective organs, but

each differing from the others according to the specific character of the nerves by which it is conveyed. It is accordingly easy to explain why tenesmus should be symptomatic, on the one hand, of cystitis, calculi in the urinary bladder, hypertrophy in the prostate gland, hysteria, polypi of the womb, and prolapse, inversion, or retroversion of that organ, all which operate by pressure on the rectum; and, on the other, of dysentery and most other organic affections of the intestine, all which operate in disturbing the circulation through its capillary arteries. Strictly analogous to tenesmus is strangury, consisting in an equally constant desire to void the urine, when little or none is contained in the bladder, and excited, like tenesmus, either by decided mechanical compression of this organ by foreign bodies, or by some inequality in the circulation through the capillary arteries of its coats, both equally giving rise to the only kind of sensation which its sensific nerves are capable of communicating. It is accordingly symptomatic, on the one hand, of a calculus or other similar body contained within the bladder, and, on the other, of cystitis, the extension of a gonorrhœa, &c. the more especially the nearer the irritation approaches to that spot of the bladder in which its greatest sensibility resides.

Such, then, are the chief preternatural sensations to which individual organs are subject from disease; but there are some others to which every part of the body is more or less liable, in particular the sensation called anxiety and pain. The term anxiety, in its medical acceptation, signifies a very different kind of feeling from that which it implies in its moral sense. In the latter it is almost synonymous with

solicitude, but in the former it signifies a peculiar sensation in either a part or the whole of the body, not easily defined by words, but easily illustrated by examples. If, for instance, a person holds his breath for a short time, he feels a sensation in the chest, not like any of those which have been already described, and still less like pain properly so called; and a similar sensation is perceived about the heart when the blood is transmitted with difficulty through this organ, about the stomach when the alimentary matters are too long retained there, and about the rectum and urinary bladder (the sensations in these two last instances being quite distinct from those more acute sensations called tenesmus and strangury) when the bowels are costive, or the urine is not voided at the proper time. In all these cases the sensation called anxiety is obviously occasioned by the several organs becoming oppressed by the accumulation within them of their natural stimulus; and it appears that anxiety may be always traced to a function, as it were *deferred*,—to an organ being irritated and excited to an action which, from some cause or other, it is incapable of performing. Anxiety is a constant symptom of an inordinate influx of venous blood into the lungs, as in angina pectoris, asthma, &c.; or a preternatural retention of blood in this organ, as in incubus from lying on the back: in the two former cases the inspiratory process (during which chiefly the blood reaches the lungs) being inordinate, and in the latter the influx of blood being impeded by posture. Anxiety is symptomatic also of the first stage of fever, in which the accumulation of blood in the lungs and heart is absolute; as well as carditis of either the left

or right side of the heart, hypertrophy with diminution of its cavities, aneurism, morbus cæruleus, polypi, or ossification, dropsy of the pericardium, &c.; in some of which cases the accumulation of blood is absolute, in others only relative, the cavities of the heart being diminished so that the same quantity of blood produces more than an ordinary irritation. It will easily be understood, also, why anxiety should be a constant attendant on dyspepsia, as well as on all diseases of which constipation is a symptom, and on retention of urine from any cause. But besides these extreme cases of anxiety, there are other minor cases of the same sensation, familiar to every one under the name of fidgets, a sensation (when otherwise than symptomatic of disease) so frequently induced by long fasting, every kind of solicitude, the necessity of listening to long tiresome stories, or great bodily fatigue, on the one hand, or every irksome restraint on the other; and it appears that in all these cases the immediate cause of the uneasy sensation in question is still the same as that to which has been ascribed the more acute cases of anxiety already noticed. All the ordinary causes of fidgets are obviously those which tend to diminish the energy of the brain, and thus to cut off from the other parts of the body, and particularly from the lungs and heart, a portion of that stimulus which they should constantly derive from this organ, so that these natural functions being more or less impeded, there is a preternatural accumulation in them of their natural stimulus; and that such is the case seems to be obvious from the means that we commonly take to relieve ourselves from the uneasy sensation

in question, such as sighing, yawning, stretching the limbs, swinging the legs, shifting the seat, or motion of any description, all of which are calculated to accelerate the processes of respiration and circulation, and thus to relieve the organs principally overloaded from a portion of the stimulus which oppresses them. There is, moreover, a particular kind of anxiety which supports in a striking manner the view which is taken above of the cause of fidgets in general. We allude to that which used to be technically called in former times "anxietas tibiarum," or that incapacity to keep the legs still so common in old people at all times, and which every one must have experienced, particularly in the evening, after taking too much fatigue, or from depressing mental emotions. Now there can be no doubt but that, in these instances, the uneasy sensation arises from a preternaturally tardy course of the blood through the veins of the lower extremities, or those veins through which the circulation is always kept up with the greatest difficulty, and which therefore are most liable, from any exciting cause, to become overloaded; and accordingly that accumulation which in a minor degree produces only anxiety, will, if increased, go on to œdema of the ankles, and, if still further increased, to ulceration. The means which we take to remove this uneasy sensation, such as continual motion of one leg upon the other, rubbing the legs, placing them horizontally, as upon a sofa, or, if that will not do, upon the table, or even upon the mantlepiece, are all directly calculated to relieve them from the oppression under which we have supposed them to labour, and accordingly strongly corroborate

the view which we are desirous to inculcate of the immediate cause of anxiety, as well in this case as in every other.

The sensation called pain differs from anxiety in being much more acute, but frequently much less intolerable. When produced otherwise than by intense external pressure, it seems to be indicative of either inflammation or spasm, in both which cases it may be said to arise from interstitial pressure, the sensific nerves of the contiguous tissues (not, as Hastings supposes, the nervous fibrillæ of the vessels themselves, which are ganglionic alone) being compressed and irritated in the former instance by the capillary arteries, which are dilated to a greater degree than that which is sufficient to produce formication alone; and the same sensific nerves of the muscular tissue itself being in the latter case in the same way compressed and irritated by the minute muscular fibres which are thrown into a state of irregular contraction. It will be easily understood, therefore, why pain arising from inflammation should be always more or less continued, while that arising from spasm is always alternated with periodical intermissions, as well as why, in the former case, the pain should be increased by pressure, while in the latter it is alleviated by the same means; since in the former case we add to the previous interstitial pressure a new pressure from without, whereas in the latter we substitute merely the external pressure for the interstitial, such external pressure being incompatible with the irregular contractions of the muscular fibres from which the interstitial pressure (which is so much more intolerable) arises. Pain may be either throbbing, as in the phlegmonous in-

flammation of the cellular tissue, or pungent, as in that of the serous; distentive, as in erythematic inflammation of the mucous tissue, or burning, as in that of the dermoid; dull, as in the scrophulous, or darting, and (unlike the preceding) not much increased by pressure, as in the scirrhous: all these differences depending evidently upon the peculiar distribution of the capillary arteries and nerves in each of the tissues affected. Finally, pain may be gnawing or griping, like that experienced in parturition, the pain of which has been already described as arising from a kind of cramp; and such is the case in spasmodic affections in general.

By some ancient pathologists, pain, like taste, was absurdly described as sour, sweet, sharp, salt, astringent, and so forth; but this classification is not much more ridiculous than many others which have been offered by the moderns. On a subject so totally irreducible to rule as this for evident reasons must be, it is certainly best to avoid all attempts at system, and to use, in our descriptions of the various kinds of pain, those terms which are commonly employed by the sufferers themselves, and which are generally best adapted to convey a just idea of them.

CHAP. VIII.

THOUGHT.

HALLUCINATION — SPECTRAL ILLUSIONS, HOW PRODUCED — ACOUSTIC ILLUSIONS — NOSTALGIA — HYPOCHONDRIASIS — MONOMANIA — CHANGES IN CIRCULATION OF BLOOD IN BRAIN — IDIOTISM — TORPOR — PERTURBATION OF THOUGHT — PASSION — DRUNKENNESS — MANIA — IDIOTISM — DISTINCTION BETWEEN.

Having thus spoken at sufficient length of the more common perturbations of sensation which are symptomatic of various diseases, we have next to say a few words on the changes taking place in the function of *thought*. As sensation depends upon some primary irritation conveyed by the sensific nerves to the sensorium, so thought depends upon some primary sensation conveyed probably along the white portion of the brain to the gray, and every modification of it therefore must arise either from some peculiarity in the primary sensation, the instrument by which it is conveyed, or the seat of the faculty of thinking itself. To the peculiarities of the sensations we need not again allude, and the changes which they will severally produce in the thoughts are sufficiently obvious; and with respect to the instrument by which these are conveyed, any change in this, as a mere conduit, can affect the thoughts only negatively. The faculty of thinking, however, may be either *locally* too energetic, or too dull; or generally too energetic, too

dull, or altogether irregular; and in any one of these ways may give rise to changes in the function in question. If the faculty of thinking be locally too energetic, the consequence will be, according to circumstances, various degrees of hallucination, or inordinate desires, such as satyriasis, nymphomania, or nostalgia; hypochondriasis, or monomania: if, on the contrary, too dull, the consequence will be a *defect*, to a greater or less degree, of certain natural faculties or propensities. If generally too energetic, the consequence will be a preternatural energy and *impetuosity* of all the thoughts, but without any perturbation; if, on the contrary, too dull, a preternatural hebetude, taking the form of either torpor or *idiotism* to a greater or less degree. Lastly, if the faculty of thinking be generally irregular, the consequence will be a general perturbation, greater or less, of all the thoughts—constituting delirium or mania. Of the probable nature of each of these affections we shall say a few words in the order in which they have been enumerated. With respect to hallucination, it may perhaps be defined to consist in "an idea (derived, of course, originally from sensation) reproduced by the memory, and embodied by the imagination." Of this we have examples in the return, sometimes of peculiar odours, tastes, or feelings, which we have previously experienced, but much more frequently of certain images or sounds, and this with so much distinctness and vividness as not only to induce the belief that they arise from the ordinary physical causes, but even to supersede the impressions which such physical causes are at the same time exciting. In this state present sensations are more or less overwhelmed by the re-

membrance of past sensations, re-embodied by the imagination in the same way as in a trance or ecstacy. Sensation in general is superseded by imagination, albeit exerted now in a different way. Such renewed images we have already alluded to under the head of spectral illusions, and the recorded examples of these are numerous and wonderful, and such as may well explain the origin of many of the hobgoblin stories which have in all ages amused and alarmed the vulgar, from the time of Brutus and his evil genius to the present.*

* Among the best accredited of these are those of Tasso and his familiar spirit, and of Ben Johnson, who used to entertain himself for hours together in watching the combats of imaginary Greeks and Trojans on the ball of his great toe. One of the most celebrated cases of this kind, however, was that of Nicolai the bookseller of Berlin, who was for many months (from September 1790 to April 1791) haunted by all kinds of phantoms; and another very interesting case is related in the Phrenological Journal for 1828, of a gentleman who, when confined to bed by sickness, saw for several successive nights the figure of a pretty female acquaintance sitting by his bedside, with a placid smile on her countenance. He recovered, and for eighteen months was free from any further visitation; but at the expiration of that time, on being on one occasion very much excited, she appeared again, but now under a very different aspect, her body having become loathsome from putrefaction, and her features having assumed a ghastly and menacing expression. A similar case is related by Dr Abercrombie, of a gentleman who on one occasion saw the spectre of a female in a large black bonnet, and enveloped in a mantle, enter his room and advance towards him; and another by Sir D. Brewster, of a lady, who, on raising her eyes suddenly after reading, saw the seat opposite her occupied by the image of a deceased sister of her husband, attired in a dress which she had never seen her wear, but had heard described as the one she wore during her last illness. A very amusing story also about the outline of a light-blue dog, which for some time harassed an unfortunate gentleman, is related in the first volume of the Physician's Diary, where reference is made to several of the same kind.

Now, the question arises, are these and other similar cases to be referred to an intensely vivid operation of some parts of the brain alone (Hibbert), or do they originate in an actual irritation set up *de novo* in the organ of sight, and giving rise to sensation and thought in the ordinary manner (Brewster)? For many reasons, we are disposed to adopt the former opinion, 1st. because it is much better established that memory and imagination are capable, spontaneously as it were, of renewing ideas, than that any other process is capable spontaneously of renewing irritation and sensation; 2d. because, although many irritations of the retina produce the sensation of light, it is difficult to conceive that any could produce that of arranged light, such as is necessary to constitute an image; 3d. because it is only, or chiefly, under circumstances of intense cerebral excitement, without any particular excitement of the organ of vision, that such phantoms have occurred; and, 4thly. because similar excitements often excite, in like manner, various propensities, such as the desire of venery, &c. without any corresponding affection of the organs from the irritation of which such propensities usually arise. We believe therefore that it is in the "mind's eye," and not in the "body's eye," that the spectral illusions have their origin; and it appears not difficult to conceive, that if those parts of the brain which are destined in general to be excited by the sensations derived from the organ of vision, and are susceptible of no other impressions,—for example, the organs of form, size, colour, &c.—be excited by any other means, the result may be an idea of such a combination of these properties as constitutes an image

as perfect as could have resulted from the sensation itself, in the same way as the impression of what we call light is as vivid from galvanism, or a blow on the eye, as from a sunbeam.

Acoustic illusions are less common than spectral illusions *per se*, but they are very common as a symptom of general insanity. Thus maniacs are frequently annoyed by the constant repetition into their ears of the most horrid obscenities and blasphemies, and often imagine themselves urged by some fiend to the commission of the most horrid crimes. The same explanation is applicable here also—a preternatural excitement of those parts of the brain destined to be excited in general by sensations derived from the organ of hearing, and which are susceptible of no other impressions, which preternatural excitement gives rise to an idea of such a combination of sounds as constitutes sometimes articulate speech, at others various other noises, as perfect as could have resulted from the sensation itself. These illusions do not constitute madness, unless there is a belief in their reality. To the same head of locally increased energy of the faculty of thinking, is to be referred the inordinate desire to return to one's native country, which has been sometimes noticed, not only in individuals, but in whole tribes, as the Africans, Swiss, and Highlanders, and is attributable, of course, to an excessive excitement of that portion of the brain which is the seat of the love of country, and differs from the previously enumerated desires and propensities in having its origin perhaps *always* in the brain, and in not depending for its development on any irritation excited elsewhere.

We come next to hypochondria and monomania, in both which there is some ruling delusion; and they seem to differ only in this, that in the former this delusion always seems to have reference to the state of the patient's own body, and in the latter to some circumstance quite unconnected with it. The delusion in these cases is frequently quite unaccountable, and so obstinate as to rank under the head of insanity. The most remarkable instances of these occur in hypochondriasis. A long and amusing book might be compiled from histories on record, of the extravagant fancies of persons troubled with this "maladie sans maladie." Thus it is related by Pausanias that on one occasion the women of Argos all with one consent fancied themselves cows. But a much more favourite conceit of hypochondriacs of former times was that of fancying themselves possessed by devils, and accordingly going naked, and taking up their dwelling in the mountains and among the tombs. It was on this account that they were frequently confounded with ventriloquists and epileptic persons, under the name of Δαιμονόληπτοι. This conceit was in vogue principally during the dark ages, and the fanatical times which subsequently debased this and the other European countries, when the pretended art of exorcising was a source of no small ascendency and emolument to the scoundrel priests, whose interest it was to keep up the infatuation, and who, failing in real *soi-disant* demoniacs, used to suborn their own creatures from time to time to personate them. The circumstance however of some of these miscreants being brought to the stake for their misdemeanours in the reign of Elizabeth, and the exquisite satire of this wild notion given

by Shakspere in the character of Edgar and his foul fiend, or rather his legion of foul fiends, brought it a little into disrepute in this country; but it still continued rife in France down to the end of the last century. Another prevalent whim of hypochondriacs in former times was that of fancying themselves wolves or dogs, so much so as to obtain for its victims the names of λυκανθρωποι and κυανθρωποι; their practice, according to all the authors of these times, being to prowl about in search of prey. The last occurrence of this kind appears to have taken place in Germany in the seventeenth century. But besides these general forms of hypochondriasis, numerous isolated examples are on record of persons so affected imagining themselves all sorts, not only of animate things, as horses, rabbits, cocks, sparrows, &c., but also inanimate things, as trunks of trees, tea-pots, chamber-pots, great-coats, tiles, shoes, barley-corns, crown-pieces, &c.; or that they had all sorts of things, animate or inanimate, either in their insides or attached to the surface of their bodies, as flies, vampires, &c. which were continually sucking their blood. At other times hypochondriacs have fancied that their bodies were frozen, or that they were too vast to pass through any ordinary door, or that their nose was larger than all the rest of their body; or, on the contrary, that they were small and feeble like sucking babes; that they were made of glass, and therefore not to be touched or handled, or of butter, and therefore not to be brought near the fire, as in the case of the baker related by Donati; that their face was turned backwards; that they had lost some of their members, as happened to Artemidorus the grammarian; that they were beheaded, as in a case

related by Alexander of Tralles; or even dead, as in another related by Bailon; that they were the devil himself, of which numerous instances are recorded; and, lastly, that they had, like Molière's malade imaginaire, every conceivable and inconceivable disease, which is the ordinary delusion. A most spirited account of the fancies which distinguish this affection, and of other false creations proceeding from a heat-oppressed brain, is given in the Anatomy of Melancholy by poor Burton, himself a miserable victim of the evils which he so graphically describes. In its mildest forms of low spirits, blue-devils, vapours, spleen, &c. it has been at one time or other experienced by us all. From this form of perturbed thought that called monomania differs only in not being confined to the state of the body. It may relate to any thing, but is always confined to one, the person on all other subjects being perfectly collected; and a propensity to destruction is a form of this, of which there are many curious examples on record.

Another common delusion is, that the affected person is a knight-errant, or that he is a high and mighty prince, or related to Bonaparte; or that he is Jesus Christ, or that he has existed before time, and is God himself. Sometimes, on the other hand, he imagines himself a wretch, ruined in this world and condemned in the next. It is this form of the disease which frequently leads to the commission of suicide; and this practice has been always more or less prevalent. It was remarkably common, as every body knows, among the ancients, who must certainly have been sometimes dreadfully at a loss for an excuse for self-destruction, when we find one man drowning himself for the love

of Amphitrite, and another going to hell for the love of Proserpine. In modern times, the practice of suicide has been commonly considered, since the publication of Dr Cheyne's English malady, as more prevalent in England than elsewhere; but from some recent statements it appears that it is considerably more common in Paris, Berlin, and other countries on the continent, than in London.

The various forms of hypochondriasis and monomania can be explained only on the presumption, that in each, a certain part of the brain, the seat of that form of thought the excessive energy of which gives rise to the prevailing delusion, is preternaturally excited, and in a state probably of chronic inflammation. Thus an over-excitement of the organ of form, size, colour, &c. may conjure up to the imagination of the hypochondriac, not merely spectral illusions of the fallacy of which he is conscious, but forms and modes of personal existence, by which the impressions derived from the senses are more or less obscured, and they become stamped with the impress of reality; and a similar over-excitement of the organs of destructiveness, pride, caution, veneration, &c. may in like manner cast over the monomaniac the prevailing crotchet under which he labours. Such, then, appear to be the chief peculiarities of the faculty of thinking, dependent on a preternatural excitement of certain parts of the brain; and it is easy to understand that too little excitement of these or other parts may equally give rise to a defect of certain natural faculties and propensities. Thus, some persons have no sexual desire—others no love of offspring, nor of country—no spirit, no pride, no any thing; but of this enough.

A few words remain now to be said of the peculiarities of the faculty of thinking, resulting from a too great or too little general excitement of the brain, and a general perturbation of this organ; including the consideration of the preternatural general impetuosity of the thoughts, torpor or idiotism, and delirium or mania.

The faculty of thinking is too acute for the most part under the same circumstances as sensibility is so, as in the second stage of fever, and in arachnitis of the surface of the brain; whereas it is too obtuse under opposite circumstances, as in the first stage of fevers and nervous apoplexy on the one hand, and in arachnitis of the ventricles of the brain in encephalitis and sanguineous apoplexy on the other. The apparent reason of these peculiarities need not again be insisted upon. It is obvious that under the former circumstances there will be a greater than usual accumulation of blood about the gray matter of the brain, and under the latter a less quantity than usual; and as the deposition of nervous matter may be presumed to be, *cæteris paribus*, proportioned to the quantity of blood contained in the capillary arteries, it must follow that in the former case there will be an increased, and in the latter a diminished deposition of gray matter of the brain, the immediate seat of the faculty of thinking. In these last instances, the diminished deposition of gray matter seems to depend upon an increased deposition of white, which stands probably to the former in the relation of ducts alone. But as the brain, collectively taken, is an incompressible organ, contained within an undilatable cavity, it follows, that if there be too much blood in the white portion, there must be too little in the gray,—that, in

fact, the white matter now exercises a pressure upon the gray, almost equivalent, as has been before remarked, to that produced by depression of the bones of the skull, except that the pressure is from within instead of from without; and hence it is as easy to understand how too much blood in the central parts should render the thoughts dull, as how too much blood about its surface should have an opposite effect. To these facts we have before alluded when speaking of the physiology of sleep, as well as of the pathology of diminished sensations; and it is only in this way that we can explain how too much blood in the brain, collectively taken, should give rise at one time to increased vivacity of the thoughts, as in arachnitis of the surface, and in the hot stage of fever, and at another to perfect sopor, as in sanguineous apoplexy.

It furnishes further support to this doctrine, that in rachitis, in which, from the yielding of the bones of the skull, the surface of the brain becomes preternaturally developed, as observed by Ludwig, the intellectual faculties are generally precocious, although the premature exercise of these is apt, like the overstraining of any of the faculties, to be followed by their total destruction; and it is in this way that we must explain the fatuity of Cretins and others, who in infancy have laboured under rickets. As far as we are aware, a preternatural vivacity of the thoughts is not peculiar to any other diseases but those which have been mentioned; but an inordinate dulness of them is an attendant likewise on jaundice, on the morbus cæruleus, on asthma, and on some other diseases; nor is the explanation of these facts, upon the principles just laid down, at all difficult. In asthma,

owing to the preponderance of the inspirations over the expirations, there is, what Dr Holland would call, an internal circulation instead of an external circulation; and we have already often insisted upon the fact, that the blood cannot be withdrawn from the surface of the body without being withdrawn in the same proportion from the gray matter in the brain, which so intimately sympathizes with it, so that in asthma precisely the same effects result as in the cold stage of fever. But it is necessary, not only that a certain quantity of blood should circulate through this portion of the brain, but that this blood should be neither deteriorated by absorbed matter, as in jaundice, nor only imperfectly purified, as in morbus cæruleus; and the depraved or deficient deposition of nervous matter in these diseases only corresponds to the depravation or defect of all the other secretions.

Idiotism seems to differ from the torpor just spoken of in this, that in the latter the faculty of thinking is oppressed, in the former it is defective. Torpor is akin to the *apparent* muscular debility at the beginning of fever, idiotism to the *real* muscular debility at the end of it. In both cases there is too little deposition of gray matter, but in torpor the blood-vessels are recoverably inert, in idiotism they are irrecoverably so. In general, in idiotism all the mental faculties are equally defective, but not always. Of idiotism, as distinguished from mania, we shall speak directly. The perturbation of the faculty of thinking includes delirium and mania, which seem to differ from each other only or chiefly in the circumstance of the former being a result of fever, and of temporary duration, whereas the latter is

independent of fever, and more or less permanent. Now, if increased intensity of the intellectual operations arises from too much, and a diminished intensity from too little blood, in the gray portion of the brain, it is *a priori* probable that such a perturbation of the thoughts as occurs in delirium and insanity will result from an unequal distribution of this blood through the several parts of which this portion of the brain consists, so that some are more while others are less excited than natural. The simplest degree of perturbation of the thoughts seems to constitute what we call a *passion;* and that a passion is a temporary insanity, has been at all times admitted. Now, the exciting cause of any passion must be presumed to operate by producing, first, a constriction and afterwards a dilatation of the capillary arteries of some particular part of the gray matter of the brain, so that the thoughts to which these parts are more particularly subservient are preternaturally energetic, and the balance is lost. The same thing seems to take place also in *drunkenness*, the effect of which is, owing to the sympathy between the stomach and the brain, to produce, first, a constriction of the capillary arteries, and then a relaxation, giving rise to at first only a general accumulation of blood in the gray matter of the brain, so that the thoughts are at first only preternaturally vivid, but subsequently to a greater accumulation in some parts than in others, so that they become afterwards perturbed. It is precisely this line of action which is gone through in delirium, the accumulation of blood in the gray matter of the brain, which is at first general, and displayed by a general vivacity of the thoughts, becoming afterwards parti-

cular, and giving rise to their perturbation. When this perturbation is independent of fever, and permanent, although probably still dependent upon a similar state of the brain, it constitutes mania, although it is not every slight degree of perturbation which is called by this name. Strictly speaking, perhaps, any state in which the thoughts do not precisely correspond in degree to their exciting causes, is one of insanity, and (if this is general) of course of mania; but it is not in general called by this name until the perturbation is excessive. Mania in all its forms may be defined to consist in a defect of balance in all the intellectual faculties, without any defect of power; and it is thus distinguished from idiotism, which consists in a defect of power in these faculties, without any defect of balance. It is a trite way of distinguishing mania from idiotism to say, with Locke, that the former consists in a sound judgment from false principles, whereas the latter consists in a false judgment from sound principles; and it is a great pity that so terse and pretty a definition should be so far from the truth. It is no doubt true that a maniac judges soundly, if, fancying himself a king, he demeans himself "as every inch a king;" but he judges falsely in so fancying himself, which at once confounds the proposed distinction. A maniac sometimes reasons falsely from sound principles, at others soundly from false principles, but an idiot does neither the one nor the other. As far as he reasons, he reasons like other men, but he reasons not so deeply as they. Mania is an *absolute* affection, as consisting in a loss of equilibrium, while idiotism is a *relative* one, as consisting in imbecility, a term which necessarily implies comparison. The most

drivelling idiot is not an idiot with respect to many of the lower animals, since he excels them in intelligence; whereas the most talented man is an idiot with respect to God Almighty, since he infinitely falls short of him; but a maniac is a maniac *per se*. No man, who is one, ceases to be so when compared with the lowest degree of intelligence, nor does any man who is not so become such when compared with the highest. The great Locke, it is said, used to arrange in his own mind the persons of his acquaintance into men of three syllogisms, men of two syllogisms, and men of one syllogism, and so forth. Now, Locke's men of two syllogisms were idiots with respect to those of three, and those of only one with respect to those of two, but they were not maniacs either in this or any other relation. As an acknowledged maniac, so an acknowledged idiot, is one whose aberrations of judgment in the former case, and deficiencies in the latter, exceed a certain point, although it must be confessed that there is an infinitely less disparity of intellect between confirmed idiots, and many who by common courtesy rank as reasonable creatures, and men of ordinary, not to say exalted understanding. Many other definitions of insanity, besides those we have alluded to, have been proposed by Beattie, Arnold, Crichton, Haslam, Adams, Spurzheim, Knight, and others; but they seem for the most part considerably more to confuse than to illustrate a subject which every body feels that he sufficiently understands. "For to define true madness, what is it but to be nothing else but mad;" and we attain the greatest degree of precision of which the subject is susceptible, by re-

presenting it as merely a loss of balance in the intellectual operations.

The character of the delusion in delirium and insanity may be infinitely various, not only in different individuals, but in the same individual at different times. In general, however, different thoughts succeed each other with the utmost rapidity, and *apparently* without any sort of connection. This apparent want of connection, however, depends upon rapidity, as in sleep. We are not to conclude that a maniac does not understand us when he gives a foreign answer (a delirious man however often does not, for it is generally combined with some coma). Certain organs, however, are more usually excited than others, such as sexual love, vanity, caution, imagination, &c. Under ordinary circumstances, mania, and the other morbid affections recently spoken of, are probably functional alone,—that is to say, arise from an unequal distribution of the blood, and consequently an unequal deposition of nervous matter, owing to some fault of the capillary arteries of the surface of the brain; but a similarly unequal deposition of nervous matter may take place also from other causes, as from preternatural indurations, or softenings of various parts of this surface, and other organic changes, into which it is unnecessary to enter; and that the functional affection of the brain is often, perhaps generally, symptomatic of disease of other parts, in particular of the stomach and bowels, is now universally known. But it is with the immediate state of the brain alone that we have any thing to do at present.

CHAP. IX.

VOLUNTARY MOTION.

SPEECH—STAMMERING—ATTITUDE OF THE BODY—SUBSULTUS TENDINUM—POSTURE IN DIFFERENT DISEASES—GAIT—SPASMS AND CONVULSIONS—TETANUS—EPILEPSY—HYSTERIA—CHOREA—TREMBLING—DELIRIUM TREMENS—SLEEP.

The last function of the alterations in which, as symptomatic of disease, we have to speak at present, is voluntary motion. Under this head were included, in the physiological part of the subject, five classes of motion as connected with respiration, digestion, and the discharge of stools and urine, generation, sensation, and locomotion; and it might be supposed that the alterations from disease in the several motions enumerated in each of these classes should here be detailed in the same order. Thus, under the head of *inspirations* were described the mechanism (because they *may* be affected voluntarily) of snoring, sighing, yawning, hiccoughing, and hooping, and under those connected with *expiration* (for the same reason), of sneezing, groaning, screaming, and coughing; but, as symptomatic of disease, these motions are always involuntary, and have consequently been already spoken of under the head of alterations in the function of *respiration*. The only motion therefore connected with respiration which remains to be consi-

dered, is *speech*. So also, as connected with digestion, were enumerated the motions of the lips, tongue, and muscles of the jaws, as well as the organs concerned in excreting the stools and urine; but the alterations from disease in the former, as more connected with a *changed aspect* of these organs, have been already spoken of under this head, while those in the latter have been included under the head of digestion. It remains then only to say a few words in this place, of stammering and loss of speech on the one hand, and of morbid changes in the function of locomotion on the other. It has been elsewhere observed, that the function of speech is an example of the greatest possible delicacy of muscular motion, and that it is accordingly the first to fail in any general perturbation of such motions, as in violent emotions of any kind, and in incipient intoxication. In these cases the affection of the hypoglossal nerve is slight and transitory, but in habitual stuttering it is more severe and permanent, and such as to require, in every instance, a more or less violent exertion of volition to overcome it; but when once overcome—that is, when the articulation of some obnoxious word has been once effected—the rest follows for some time even more volubly than naturally, so that, as Shakspere says, their course is like that of water through a narrow-necked bottle, which gives us either none at all, or too much at once. It has been asserted lately, that the whole defect consists in the person's having acquired the bad habit of attempting to speak during inspiration, instead of during expiration; but this is certainly not the case. We can all speak during inspiration, but we do not stutter in consequence; and the reason

that persons with this defect *do* frequently speak during inspiration is, that they cannot choose their time as others do, but are glad to articulate when they have succeeded in calling the tongue into action, whether the air is at that moment passing out of the lungs or into them. It is true, that if such persons will always take a deep inspiration, as enjoined by Mr Borthwick, before attempting to speak, and, when they do make the attempt, will always use a tempered stream of air, they will experience much less difficulty; and accordingly, many who habitually stammer when they attempt to speak, display no such defect when singing; but all this depends rather upon the greater presence of mind, and consequently greater nervous force which the power of obeying stated rules implies, than in any actual efficacy in the measures proposed. Stammering and loss of speech, as a symptom of disease, are often functional alone, and are often dependent upon a disordered state of the stomach and bowels, but frequently organic also, as in incipient apoplexy, or after recovering from the attack; and it has been found that in most cases in which there have been found characteristic symptoms, the lesion has been about the corpora olivaria and origin of the hypoglossal nerve.

Under the head of alterations from disease in the function of locomotion, may be included, of course, every peculiarity in the attitudes as well as in the motions of the body, resulting from various causes. Thus, in standing, the body may rest unequally upon the two legs, as in morbus coxarius, the disease within the hip-joint preventing the patient from pressing on that limb, so that the pelvis on that side subsiding,

gives the diseased limb the appearance of being much longer than the other. In sitting, the body may be either inclined backwards, as in empyema and hydrothorax, this posture being the best adapted to relieve the lungs from the pressure of the liquids contained within the chest, or forwards, as in dropsy of the pericardium, the passage of the blood from the lungs to the heart, which is now oppressed, being apparently more easy in this than in the reclining posture, for reasons which have already been sufficiently explained. It is for a similar reason also that in a paroxysm of difficulty of breathing, such as occurs in the morbus cæruleus, when the heart has so much more difficulty in receiving the blood from the lungs, the patient in general throws himself on his belly. Mr John Bell, supported by Burns, imagined that this posture is preferred in these cases, in order, by pressure, to assist expiration, and thus afford space for a greater subsequent draught of air; but, to say nothing of the certainty that it must impede inspiration in the same degree that it favours expiration, or of the well-known fact that in asthma, when the object really is to assist the action of the respiratory muscles, the person assumes a very different posture, this explanation is rendered void, as well by analogy, as by the fact that the relief experienced is the same though the patient turn only on his hands and knees. It is not because the blood is insufficiently changed in the lungs, but because the heart is overloaded, and the ordinary powers are insufficient to propel it, that it becomes accumulated in the former; and how much this posture is calculated to obviate such an accumulation, has been already sufficiently explained. Dr Holland notices the in-

adequacy of Mr Bell's explanation, but does not suggest any other, except that this posture is to relieve the anxiety of the chest, which it obviously affects in the manner just described. In lying, the posture may be, as in the last stage of typhus fever, and all cases of great debility, on the back with the limbs extended, instead of on the side with the limbs slightly bent, the natural attitude of health, which is owing to the flexor muscles having now lost their accustomed stimulus, as well as to the decay of muscular power in general; so that the effort to keep the body on its side, particularly when the limbs are not bent, being impossible, it in consequence necessarily gravitates, as in infancy, to the broadest part. It is a sure sign, therefore, of our patient being better, if, after leaving him lying on his back, we find him on his side the next visit. In the state just alluded to, however, there is frequently, owing to an irregular renewal of the accustomed stimulus to the voluntary muscles, a convulsive twitching of the limbs, technically called *subsultus tendinum*, the tendency of which, when it affects the upper limbs, is to give the patient the appearance of catching at shadows, picking at the bed-clothes, &c., technically called carphologia, and when in the lower limbs crocydismus.*

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* Subsultus tendinum is attributed by a recent nosologist to the principle of irritation, which is often apt to accumulate in the tendinous extremities of the muscles; as if there were any earthly cause why such a principle, even though it existed, should accumulate in these tendinous extremities, and as if, though it did there accumulate, it could possibly give rise to the symptom in question, which is unfortunately produced by the contractions of the bellies of the affected muscles, and not by their tendinous extremities. A man would

If the posture be upon the side, it may be either upon one side constantly, as on either the diseased side in peripneumonia, hydrothorax, hepatitis, &c. the affected organ being thus immediately supported by sound parts, or on the sound side, as in pleuritis, the affected organ being thus relieved from pressure; and whether the body be on the back or side, the thighs may be more than usually bent towards the belly, as in colic, the heat and pressure so produced being calculated to relieve the pain in this organ. In walking, the gait may be shuffling, as in shaking palsy; and every kind of voluntary motion of the parts concerned is of course prevented or impeded in fractures, dislocations, rheumatism, tetanus, epilepsy, chorea, hysteria, and general palsy. Spasms and convulsions, also, like those of tetanus and epilepsy, frequently occur in myelitis, encephalitis, and arachnitis, whether of the spinal marrow, or of the figurate or convolute surface of the brain, as well as in the second stage of hydrocephalus, which is commonly distinguished by an incessant rolling of the head. The only general explanation of these facts which can be given is, that in these instances, that irritation which, in ordinary circumstances, is called into action by the will alone, is now called into action by other causes; and hence it is sufficiently well known, that a slight

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leave a warehouse with a particularly clear idea of the mechanism and powers of the crane employed in raising bales of goods, if told by the person employed to instruct him, that the said bales were raised by a principle of irritation, often apt to accumulate in the ropes attached to them; yet of a precisely similar nature is the vague and unmeaning trash which is often held out by pretended medical theorists under the head of explanation.

degree of pressure upon any of the central parts of the nervous system gives rise commonly to spasms and convulsions of the voluntary muscles, whereas a greater degree of pressure made upon these parts has in general the effect of totally palsying these muscles. With respect to tetanus, it has been presumed by Fernel, Morgagni, Valsalva, Lieutand, Bossieri, Frank, Breras, Sanders, Esquirol, Reid, and others, that this disease, like hydrophobia, with which it has been sometimes injudiciously identified, consists, not in an essential spasm of the affected muscles, but in an affection of the spinal marrow or its membranes, of which the spasmodic affection is symptomatic. But myelitis, or arachnitis of the spinal marrow, as arising from common causes, does not produce tetanus, any more than the former produces hydrophobia; and as the admission of specific exciting causes is therefore necessary, the disease must be admitted to have somewhat of a specific character, and may with propriety be considered to consist essentially in these phenomena, which most directly result from such causes, and the inflammation of the spinal marrow and its membranes, when it is met with, be regarded rather as a consequence than as a cause of these phenomena, particularly when the want of fever and the other symptoms of myelitis, and the general inutility of these remedies,—which are frequently successful in the latter,—are taken into account. The suggestion of Mr Swan, that tetanus consists essentially in an inflammation of the ganglions, is altogether irreconcileable with the fact of the spasms being generally confined to the voluntary muscles, which are less obviously furnished with ganglionic nerves than the involuntary.

It will be easily understood how foreign bodies within the skull, or an exostosis within the spinal canal, as well as indurations of the tuber annulare, ossifications of the brain, and its membranes or tubercles, or other tumours in the course of the nerves, should frequently give rise to epilepsy and other convulsive diseases. In epilepsy and hysteria, the irregular motions occur only in paroxysms, whereas in chorea they are more or less constant, but display themselves principally upon any effort at voluntary motion being made, when the inordinate irritation going on at the roots of the motific nerves is such as to counteract, in a greater or less degree, the natural stimulus to these motions, and render them, therefore, no longer subservient to the will. Sometimes, however, chorea displays itself in successive spontaneous contractions of the muscles naturally employed in effecting particular movements, so that, instead of the irregular twitchings above mentioned as attending every involuntary motion, various motions, each sufficiently regular, but the tendency to which is quite uncontrollable, are at longer or shorter intervals performed, such as leaping, running, climbing, turning round like a top or like a roller, bending the body in the form of a bow, standing on the head, and so forth. It seems indeed to have been in one or other of these forms that chorea was first noticed when it was called enthusiasmus, and considered to be a species of hypochondriasm, those affected with it being supposed to have been affected with devils. It received its names of choreamania, or chorea Sancti Viti,—the former from the patient being incapable of walking otherwise than by leaps, and the latter from the prac-

tice of those affected with it adjourning to the shrine of St Vitus, and there leaping and dancing to music till they were either killed or cured. It is that form of chorea which consists in an uncontrollable propensity to running, which constitutes the leaping or Forfarshire ague, from having been at one time endemic in Forfarshire; and of the other forms of the disease just mentioned, a most wonderful example is related by Dr Watt in the Med. Chir. Trans. for 1814, which will very well repay the trouble of a perusal. An excellent illustration of the nature of some of these forms of chorea has been lately afforded by some experiments on the brains of some of the lower animals, in which it was found that, by injuring successively various parts of this organ, motions very similar to those just alluded to, such as running, leaping, turning round and round, &c. could be produced; so that we seem justified in concluding, that when those motions spontaneously occur, they are the result of some irritation of those parts of the nervous system, which, when artificially irritated, are known to produce them. It is hardly necessary to say that the loss of motion in palsy will be confined to the part affected, and that, accordingly, in hemiplegia it will affect one side of the body alone, whereas in paraplegia it will affect only the lower extremities. The trunk of the body, however, is never held erect in this disease, owing to the deficient action of the muscles of the loins and back.

A temporary trembling and shivering of the whole body, the nature of which has been already explained as more nearly allied to a palsy than a convulsion, is distinctive of the first stage of fever, owing, as before

said, to the abstraction of caloric from the surface of the body; and there is, besides, a continual stretching of the limbs, probably for the purpose of exciting a strong sensation, in order to relieve the incumbent anxiety. This trembling is less violent but more continued in delirium tremens and shaking palsy, in both which it seems to arise from a deficiency of the natural stimulus sent from the brain. The proximate cause of delirium tremens has been considered to be inflammation, congestion, and so forth, of the brain or its membranes; but such inflammation is not always attended with delirium tremens, whereas something very nearly allied to this disease is often the consequence of causes tending to produce a state totally opposite to inflammation, *e. g.* profuse losses of blood; and there can be little doubt, as observed by one of our best medical journalists, that the proximate cause of this is rather an imperfect supply of arterial blood than any thing like inflammation. With respect to shaking palsy, it is a singular circumstance, that this affection, as well as hydrophobia, convulsion, tetanus, palsy, and spasm, has been attributed by Bonnet, and more lately by Parkinson, to an inflammation of the spinal marrow or its membranes. It appears unnecessary here to repeat the reasons which led us to consider the two latter diseases as essentially functional, and the same may be applied with even greater force to the disease in question.

The sleep, or the periodic diminution of sensibility, the susceptibility of thought, and the power of exciting voluntary motion, may be altogether wanting, as in the second stage of fever, arachnitis of the surface of the brain, delirium tremens, and other diseases, for

the same reason that in these diseases the sensibility, the susceptibility of thought, and the power of exciting voluntary motion, are always preternaturally energetic; or it may be irregular, as in incubus and somnambulism, in the former of which, the two first faculties seem to be retained, while the last alone is lost, whereas in the latter the last is retained, while the two first are either lost or diminished. Lastly, it may be either too constant or profound, as in encephalitis, arachnitis of the ventricles of the brain, sanguineous apoplexy, asphyxia, and syncope; in the three first, from a cause which will be sufficiently obvious after what has been already said when on the subject of sensibility and thought, and in asphyxia and syncope from the deficient quantity of the blood sent to the gray matter of the brain, so that the deposition of this is impeded. The sleep also is liable to be disturbed by frightful dreams, as in hydrothorax, dyspepsia, hydrophobia, and numerous other diseases, owing to the uneasy feelings with which these diseases are attended, exciting that remarkable influence upon the sleeping thoughts to which we alluded when on the subject of dreaming.

THERAPEUTICS.

CHAP. I.

PROPHYLACTIC TREATMENT.

INDICATIONS FOR TREATMENT—TREATMENT OF DISEASES CONSISTS IN A TREATMENT OF THEIR CAUSES—THE DOGMATISTS, &C. AND EMPIRICS—PROPHYLACTIC TREATMENT—HYGIENE—CLIMATE—HEAT AND COLD—USE OF OIL—DRESS—LOCAL HEAT—LOCAL COLD—BATHS—[WASSER CUR OF GERMANY]—AIR—ALIMENT—TIME OF TAKING MEALS—PASSIONS—EXERCISE.

WE are now to enter upon the subject of Therapeutics, or the consideration of the action of those agents commonly had recourse to in the treatment of diseases; a subject upon which it will be unnecessary to occupy much time, if we keep in mind that most of these agents are precisely the same as those the continual action of which, when moderate, are essential to the ordinary functions of the body, and which, when either excessive or defective, become the most common exciting causes of disease. The principal causes of health differ only in degree from the principal exciting causes of disease, and the principal exciting

causes of disease differ only, in the circumstances under which they act, from the principal causes of recovery; hence if we can satisfactorily explain the ordinary agents of the body in maintaining its healthy functions on the one hand, and in disturbing these functions on the other, we shall have little difficulty in explaining the influence of the same or similar agents in effecting a return to health when these functions have been disturbed. The indications, or, as the word is commonly understood, the objects, to be had in view in the treatment of disease are usually arranged under the three heads of prophylactic, curative, and palliative; the first of which regards the preservation of health or the prevention of diseases, and is directed therefore against the predisposing, and still more particularly against the exciting, causes of the latter; the second regards the removal of diseases already present, and is directed therefore against the general proximate cause, of which the collective disease is as it were the shadow; the third regards the alleviation of individual symptoms, and is directed therefore against the particular proximate cause from which each of these arises. The treatment of diseases therefore consists, in fact, of the treatment of their causes, and hence the utility of the study of Etiology, and of endeavouring, when treating of Semiology, to assign a specific cause for every symptom which displays itself. It is proper to remark, that the above is not the original or correct meaning of the term indication, which strictly means an *exposition* to be collected from the symptoms of the particular state of the body which requires to be changed, and not the *object* with which the remedies adapted to effect this

change are employed; but as this exposition always immediately gives birth to an object, the latter has gradually become synonymous with the former, and we say, therefore, the indication is not that the stomach requires strengthening, but at once to strengthen the stomach, and so forth. Indications founded on the principles above proposed are called rational, in opposition to those to which recourse is had when the causes of disease are altogether unknown, which are called empirical. In former times, no general subject relating to medicine occasioned such constant warfare as the question, whether the practice of medicine should be founded on principles of reasoning, or on experience alone. On this ground the followers of all the several medical sects already frequently alluded to, the Dogmatists, Pneumatists, Methodists, &c., who, however widely they differed in other respects, all agreed in the grand principle, that it was essential to a medical man *rerum cognoscere causas*, were opposed to the empirics, who endeavoured to demonstrate the inadequacy of reasoning as applicable to medicine, and placed their whole reliance on experience. The arguments of both parties are concisely and beautifully set forth by Celsus in his introduction, but need not be here reiterated, the good sense of modern times having agreed with Celsus in considering reason and experience in medicine, not as irreconcileable enemies, or either alone sufficient, but as close allies and mutually assisting each other. The means of fulfilling the above indications are referrible to the three heads of hygiène or regimen, medicines, and surgery, to any one of which we may have recourse in the fulfilment of any one of these indications. The first, however, is

more particularly adapted to fulfil the prophylactic, and the second and third the curative and palliative indications. We shall consider each of these in the order above proposed.

Hygiène, then, relates to the regulation of those numerous agents on the body recently mentioned as the principal powers by which either a habit of body predisposed to disease is generated (for over age, sex, temperament, and idiosyncrasy we have no control), or diseases are immediately excited. It comprises therefore the consideration, 1st. of climate and situation; 2d. of heat and cold, including clothing, bathing, &c.; 3d. of air; 4th. of aliment; 5th. of the passions; and 6th. of exercise. The several excretions, and sleep, when employed in the treatment of diseases, are not so much themselves remedies, as the results of other remedies belonging to the head of medicines. From what has been already said of the agency of certain peculiarities of each of these powers in the production of particular diseases, it may be easily collected under what circumstances certain modifications of them are pernicious, and therefore to be avoided. It only remains to be mentioned in this place, such peculiarities in these powers as are advantageous, and therefore to be inculcated in the treatment of certain diseases.

The common division of hygiène, or regimen, into the phlogistic or sthenic, that by which the activity of all the functions is promoted, and antiphlogistic or asthenic, is too general to be of any extensive utility.

With respect, then, to climate and situation: in general a warm climate and a low situation are of course advisable in those diseases which are apt to occur

under opposite circumstances, particularly in scorbutus, phthisis, urinary calculi, rheumatism, gout, and scrophula; while a cold climate and an elevated situation are equally so in those which are usually occasioned by the reverse, and particularly in hepatitis, jaundice, cholera, dyspepsia, and dysentery. But in the choice of a climate and situation, perhaps less regard should be had to mean temperature than to its general equability, which appears from a table of Dr Young to be greater at Penzance than in any other part of Great Britain, and still greater successively at Lisbon, and at Minorca, Madeira, and other small islands, but perhaps greatest of all at sea. The reason of this greatest equilibrium of temperature in insular situations we have elsewhere endeavoured to explain. The least variation at London is in the depth of winter, when it seldom exceeds 6 deg. within the twenty-four hours, the greatest in spring and autumn, when it frequently amounts in the same time to 20 deg., while at Minorca it seldom or never exceeds 5 deg., and at Madeira 4 deg. Regard must be had also to the degree of moisture of the air, of which, as a lower degree than common is in general desirable, so a higher degree is supposed to be beneficial in phthisis, and hence the reputed advantage of Sidmouth and Walcheren in this complaint; and it has been not unfrequently noticed, that in those districts where intermittent fevers are most common, phthisis is most rare. Another thing to be considered also in the choice of climate is the general density of the atmosphere, a greater than ordinary degree of which, as far as compatible with considerable moisture, is likewise considered advantageous in phthisis, and hence the

Mendip valleys have been sometimes highly spoken of in this complaint; but with respect to equability in this respect, which is of scarcely less consequence than equability of temperature, the range of the barometer is least considerable in hot climates. The prevalence of particular winds, also, and the state of the water, must not be neglected in choosing a residence for invalids. General heat and cold in any climate and situation are promoted principally by excluding or admitting the air (particularly if it be moist), by employing or not employing fires, and by the use of warm or light clothing. The former is serviceable principally in catarrh, odontalgia, rheumatism, and gout; and warm clothing is necessary in most diseases of the lungs, particularly phthisis, in rachitis, scrophula, &c. The latter is requisite in the second stage of almost all febrile diseases, with the exception of those just mentioned; in epistaxis, and hæmorrhages in general; in miliary fever and variola, in syncope, and some other diseases. The beneficial effects of heat in the one class of diseases, and of cold in the other, will be easily understood from what has preceded. The importance of attention to these particulars was well known to the first physicians, although, for an obvious reason, their chief care, in the great majority of diseases, was to keep their patients cool, as ours is to keep them warm. It was for this object that Hippocrates recommends wearing in the summer shirts dipped in oil; and it was probably from the refreshing cold thus imparted to the body that the external use of oil became so general among the ancient Hebrews, Greeks, and Romans (among whom the olive-tree, as is well known, was regarded as something almost divine); and

the same practice is still very prevalent in India and Egypt, to say nothing of the mixture of grease and soot still employed in this way by the Hottentots and other savages.*

In modern times, and in this country, the external application of oil is had recourse to principally to facilitate friction, as in dropsies, tympanitis, and other tumours, to relax contracted parts, as in tetanus and hydrophobia, or for the purpose of preventing the supposed absorption of moisture by the skin, as in diabetes. It is proper to notice, also, before leaving this subject, that wearing oil-skin dresses, and clothes

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* As bread was considered the staff of life, and wine was taken to gladden man's heart, so oil was used to make him of "a cheerful countenance," and as the means of preserving health: "intus vino, foris oleo," was in former times continually insisted upon. Hence the gymnosteroi of the Greeks and the athletæ of the Romans could do nothing without their unctions, and hence this practice became at length, under Herodicus and others, a distinct branch of the hygiène, under the name of jatroliptic medicine. But it was not only as a means of preserving health and strength that oil was formerly employed; it was considered essential to the decoration of the body that it should be covered from head to foot with grease of some kind or other. Among the Greeks the practice of rubbing the body all over with ῥοδινον ἐλαιον, or some other scented oil, after bathing, is as old as the time of Homer, by whom Juno is represented as using this means to captivate her wayward lord; and had become so prevalent in the days of Solon and Lycurgus, that they found it necessary to prohibit it. The casket of precious ointment, however, found by Alexander among the spoils of Darius, seems to have had the effect of rendering the practice again popular; and though prohibited by the censors, it was carried by the later Romans to a most absurd extent, the number and prices of the scented ointments mentioned by Dioscorides and Pliny being sufficient to put to shame the catalogue of the most modish modern perfumer, and the efforts in this way of the most ambitious modern dandy. Pity that in foppery, as well as in Epicurism, we still find ourselves distanced by our predecessors.

imbued with oil, is still sometimes recommended, as by Baldwin, Trotter, Apolini, Jackson, and others, as a means of keeping off some contagious diseases, as the plague; and is said to have originated in the apparently greater immunity from such diseases of oil-porters, tallow-chandlers, and others, whose clothes are continually impregnated with grease. The oily matters in these instances have been supposed to have been of service by preventing the supposed absorption of the matter by the skin; but it appears more likely that they do good, if indeed they do any good at all, by refreshing the surface of the body, and thus rendering the cutaneous vessels less liable to be morbidly affected. With respect to dress in general, the principal recommendation of this, in the warm climates inhabited by the first physicians, was its freedom and coolness, whereas among us it is its tightness and warmth. Hence, in the statues of antiquity, and in the paintings descriptive of ancient scenes, one is struck with the wholly or partially naked figures which they everywhere represent, so different from the snug tucked-up objects to which we are accustomed. The term "bracatæ gentis," or nations which wore breeches, was applied first to the Gauls and other northern hordes, to distinguish them from their more polished but naked-rumped contemporaries; and the introduction of shoes and stockings, and other similar refinements, are of still more recent date, albeit we have not yet arrived at the philosophical nicety in the structure of the former recommended by Camper, nor the improvement in the latter, of having them divided like a glove for each particular toe, as suggested by Willick. In the midst of these improve-

ments, however, in search of heat, modern authors have had the good sense to observe, that cold air and light clothing, after the practice of the ancients, are in most febrile diseases the only thing needful, although for a time the insane doctrines of the earlier chemists about the necessary fermentations and effervescences in the blood (to be promoted of course by heat) served to substitute for this sensible application of the rule, "contraria contrariis sanantur," all the enormities, in these diseases, of the hot regimen. The absurdities of this were pointed out, perhaps for the first time, by Gemsa: it was again more forcibly decried by Sydenham, Sir J. Floyer, and Dr Baynard, and at length entirely exploded by De Haen, White of Manchester, and Cullen. To this head also belongs the application of heat and cold, whether local or general, in either the solid, liquid, or aeriform state. Local heat is sometimes promoted by heated sand, or bricks wrapped in flannel, and applied to a part, as in colic and other spasmodic diseases, or by a heated plate, but more frequently by heated water used in the manner of a fomentation or poultice, or applied enclosed in a bladder. Boiling water applied by soaking with it linen enclosed in a basin, to be inverted over the part, is a very effectual and speedy means of raising a blister, and often useful in this way in gastrodynia and other similar affections where no time is to be lost. The heated vapour of water, also, directed upon a part from the spout of a tea-kettle, may be used for a similar purpose. The ancient physicians were very fond of heated salt as a means of applying local heat, and used heated oil frequently where we use water. The heat communicated by this means may of course be made more intense, but

it is seldom requisite to employ, otherwise than as a cautery, a higher temperature than that of boiling water. It is remarkable, that by Hippocrates and Celsus, poultices were employed, not only for the purpose to which they are almost restricted in modern times—that of promoting suppuration—but also in pleurisy and other similar diseases; and the same practice is not at present uncommon with the Broussaists in France, and has been recently recommended among us by Sir Gilbert Blane, Mr English, and others. For the purposes of local cold, moistened clay is sometimes employed, as in arachnitis, or encephalitis, sanguineous apoplexy, hysteria, epilepsy, &c.; but more frequently ice or snow when they can be procured, or salts diffused in water in the form of lotions, and applied by means of cloths, which produce cold by their rapid solution; or, lastly, liquids, like alcohol, ether, vinegar, &c., applied in the same way, which do so by their rapid evaporation. The beneficial effects of heat and cold in the several diseases in which they are applied are sufficiently manifest.

The application of general heat and cold involves the consideration of baths, sometimes indeed of solids, as in the practice common in some hot climates, of earth-bathing, but much more frequently of water or air. A favourite kind of warm bath with Heraclitus and some of his immediate successors, was one of horse-dung, in which the patient lay for hours immersed up to the chin; and this was succeeded by one of hot sand, which was for a long time the general means employed for exciting general perspiration, sudorific medicines having not yet been thought of.

A bath of water is considered *hot* above the temperature of 95° F., *tepid* between that and 85° F., *tem-*

perate between that and 65° F., and below that *cold*. That modification of bathing in which the rest of the body is immersed in hot water, and cold water is poured upon the head, is called the douche, and is very popular in France. As a hot bath, the water is frequently employed in the form of vapour, the temperature of which may be raised as high as 140° F.; and by way of a cold bath the water may be either directed on the body from on high, as by the shower-bath or by a pump, or applied by affusion or by sponging.

The usual rules in the application of these remedies are sufficiently well known. What is called an air-bath consists in the application for some time of air, whether hot or cold, to the naked body; it is the simplest conceivable form of bath, since it consists in merely sitting stark naked in a room of a certain temperature.

The practice of bathing in water is coeval almost with the creation of the world, or at any rate of the flood. To say nothing of the patriarchs, the author of the oldest parts of the oldest book in the world was found among the bulrushes in Egypt by the daughter of Pharaoh, when she "came down to wash herself in the river;" and the punctilious ablutions enjoined as a part of their religion to the Israelites are universally known. Among the Greeks, systematic cold bathing was introduced by Pythagoras, who had studied at Memphis, although they had long before been in the habit of using it before offering their sacrifices, and on other great occasions; a practice frequently alluded to by Homer, Virgil, and others. The introduction of hot bathing among this people has been attributed to Medea, who, it may be remembered, is said to have restored her aged father

to his pristine youth by transfusion and parboiling him; but however this may be, it is certain that their use also was known from a very early period. The continual bathing of the Romans in "the angry flood" which intersects their city is well known; and their general adoption of this practice may be inferred from the proverb so common among them, "nec *natare*, nec literas scire," used to express the lowest abyss of ignorance. The natural hot baths also at Baiæ, near Rome, are familiar to every classical scholar; and with respect to artificial baths of this description, it is sufficient to observe, that Asclepiades, who practised at Rome in the time of Cicero, is said to have invented no fewer than a hundred new kinds of them. The mere mention indeed of the public baths of the Romans (to say nothing of their private ones) is sufficient to recall a thousand images of the highest luxury and magnificence; and that the same propensities existed elsewhere may be collected from the fact that Alexandria, in the seventh century, contained no fewer than 4000 of these edifices (memorable from having been heated on one occasion for six months by the conflagration of the books of the Alexandrian library), and they are still amazingly numerous among the Mahommedans. As a remedy of diseases, also, almost every description of bathing is particularly mentioned by Hippocrates, Celsus, and all the other ancient physicians. During the dark ages, the practice of hot bathing considerably declined, and cold bathing was kept up principally by a superstitious adherence to the primitive form of baptism; and it is during this period that one hears so much of the wells of the numerous saints,—Saint Mungo and Saint Wi-

nifred's, and so forth,—each celebrated for effecting certain miraculous cures in those who bathed therein; but the priests at length contenting themselves with merely topical baptism, and faith in the saints aforesaid waxing weaker and weaker, although the hot-bath still held its place as a remedy, cold bathing, which had been decried by the chemical pathologists on the same absurd grounds as cool air, was, for a time, almost entirely neglected. For the renewal of this practice we are indebted principally to Sir John Floyer and Dr Baynard, who, in 1709, published a conjunct work in support of it, and certainly one of the most amusing as well as instructive works in medicine. Its importance as a remedy in fevers was particularly insisted on in 1722 by the Rev. D. Hancock in his work "Febrifugum Magnum," again in 1737 by De Haens, and again about 1775 by Dr Wright and Jackson in the West Indies; but it owed its late popularity particularly to the eloquence of Dr Currie of Liverpool. Of the modern vapour-baths, the most celebrated are those of the Russians, who are in the habit, immediately after having used them heated as high as they can bear them, of rolling themselves in the snow. The douche is obviously alluded to by Celsus in the second chapter of his first book. It was employed in some diseases by Daniell in 1749, but began to attract general attention only in 1813, when it was discovered to be the long-concealed remedy in insanity employed by MM. Delahoyd and Smelte. The air-bath is a conceit of the late Lord Monboddo. An infinite deal has been written upon the effects of bathing in water of different temperatures, and much pains bestowed in order to determine whether the

hot and cold bath were respectively a stimulant or sedative, &c. It is most probable, however, that their effects are the result of their temperature alone, and that they are like heat and cold,—the former directly stimulant, so as to constrict the vessels of the surface, and indirectly sedative, so as to relax them,—and the latter precisely the reverse, though the more permanent effect of the latter will be also relaxing, for the reason already given.*

In the present day, hot or warm baths are employed principally in morbus coxarius and asphyxia, as a direct means of communicating heat; in cynanche trachealis, strangulated intus-susceptios, strangulated hernias, dislocations; in urinary calculi and diabetes, and in lues venerea; in diseases of the skin in general; in rheumatism; and in the suppression of the menstrual discharge which attends chlorosis, in order to

* How, then, is at one time heat, at another cold, useful in inflammation, since the ultimate effects of both are rather to increase that relaxation of the capillary vessels in which that state consists? With respect to heat, the answer is easy, since it is only necessary that it be applied so as to produce its primary or stimulant effects, and thus to reduce the contraction of the vessels up to the line of health; and with respect to cold, it is not much more difficult, since it is easy to believe that this may be so applied as to insure its secondary or stimulant effects also, and thus equally discuss the inflammation. Both are thus examples of the homœopathic mode. But cold has also another beneficial action in this case, that of directly abstracting a portion of the morbid heat of the part (the result of accumulation of blood), and thus relieving the vessels of a stimulus, which, although, if a little further increased, might promote the contraction of the vessels, is otherwise continually and fruitlessly exhausting what little irritability they still retain. Cold, therefore, in the words of Brown, "stops the waste of excitability," while, by allowing of its accumulation, it renders the vessels susceptible to the healthy stimulus of the warm blood which they afterwards receive.

produce a flow of sweat, and thus relieve the affected organ: and the temperate and cold baths principally in the beginning of fevers in general (in which the common way of using them is by affusion or spunging), their ultimate effects being probably to produce such a state of relaxation of the capillary vessels of the skin (erroneously called re-action) as is incompatible with the full formation of the first stage, consisting essentially in a constricted state of the vessels; and in mild inflammation of the urethra or vagina, in rachitis, in chronic palsy, in scrophula, in dyspepsia, chlorosis, &c., and in nervous palsy and apoplexy, delirium tremens, &c., in which a similar effect having been produced upon the surface of the body, the irritation is conveyed by sympathy respectively to the urethra, vagina, bones, cervical gland, stomach, spinal marrow, and brain. Showers of water are said to be effectual also in removing miasms. The douche is employed principally in insanity, and its effects must be sufficiently evident.*

* [The application of cold water in almost every form of acute and chronic disease has of late, particularly in Germany, attracted so much notice as to have received the name of a particular system of cure called there the "Wasser cur;" and although the only novelty in this system is the greater scale, and perhaps the better adapted means, of applying the remedy, yet it has confessedly been in many cases so useful, and stands at present so high in the estimation both of the public and of many of the medical profession, that it may be right to give a sketch of the manner in which it is used, and the diseases for which it is chiefly employed.

There are now about forty institutions in Germany where patients are treated entirely with cold water. The first and most important of these is at Gräfenberg in Silesia, and is conducted by a man of the name of Priessnitz, formerly a peasant of the district, who, having found the benefit of cold water in the case of a bruise, recom-

With respect to air as a remedial agent, independently of its temperature and degree of moisture, it is of course in general advantageous in proportion to

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mended it to his neighbours, and acquired so much celebrity by the cures he performed, as to attract strangers from all parts, so that, in the year 1839, the number of guests amounted to 1500.

The only water employed is the cold spring-water of the district. The kinds of baths employed are very various, according to the nature of the case. They consist either of affusion by means of the douche or shower-bath, or of general or partial immersion in water. For the latter purpose there are vessels provided of every conceivable form, adapted for partial bathing of the body, such as arm-baths, leg-baths, hip-baths, &c. Besides, cold water is frequently topically applied by means of cloths dipped in it being laid upon the part affected, and frequently renewed. The diseases in which it is said to have done good are principally peritonitis, enteritis, and cholera (?), also chronic ophthalmia, and many diseases of the skin. It is said to have been very beneficial also in rheumatism and gout; in cephalalgia, ischiagia, and the rest of that class of diseases; in various hæmorrhages, more particularly in hæmorrhois attended with habitual costiveness, when it is used in the form of clysters, consisting at first of 3 or 4 oz. of loo-warm water, and then larger quantities of cold water administered every evening on the patient going to bed. —(See Dr E. Hlawaczek die Wasserheilkunde. Wien, 1835.)

It is said to be useful also in hysteria, hypochondriasis, and general debility arising from having lived a dissipated or voluptuous life.

One of the most generally observed phenomena attending this system of cure is an aggravation of all the symptoms after its use for about a month, and frequently the appearance of a vesicular eruption over the body. This eruption excited much interest, and great attention was directed to it formerly; but since more accurate observations have shewed it to be neither constant nor of a specific character, it has lost much of its importance.

Notwithstanding the present renown of this system, there is such a want of scientific information as to the nature of the diseases in which it has been used, that, without entering into the specialities of vaguely related cases, it would be impossible to give a full description of this method of cure. (See *Munde* genane Beschreibung der Wasser-heil-anstalt und der Priessnitzischen Methode.)]—EDITORS.

its freedom from foreign matters, although some such matters, for example, the smoke arising from a fire, are, as in asthma, sometimes productive of relief, probably by affording a direct stimulus to the lungs, stronger than would have resulted from the carbonic acid, which pure air would have generated in greater quantity; and in some diseases, as in chronic pertussis, almost any change of air, even from better to worse, is of advantage, perhaps from the new stimulus it affords to the relaxed vessels of the larynx.*

The aliment, as adapted to particular diseases, is conveniently arranged into the full and sparing; the former consisting of such substances as contain much nourishment, and afford a strong stimulus taken liberally, the latter of such as contain but little nourishment, and afford but slight stimulus taken in small quantities. To the former belong, besides vegetable substances alone, all kinds of animal food, and fermented liquors in general; to the latter almost exclusively vegetable substances and water. Full diet is proper in convalescence, and in all diseases indicating debility without much fever, as general dropsies, diabetes, scrophula, dyspepsia, rachitis, chronic palsy, chlorosis, amaurosis, delirium tremens; while sparing diet is adapted in general, not only to all fevers, but also to diseases of the liver in general, urinary calculi, polysarcia, gout, sanguineous palsy and apoplexy, hypertrophy and aneurism of the heart, and aneurism

* It has been already remarked, that the earliest internal remedies were dietetical alone, and the minute attention which the first physicians paid to the esculents and poculents of their patients, lest peradventure they should interfere with the concoction of the morbific matters so frequently mentioned, was almost ludicrous.

of the arteries in general, morbus cæruleus, and other organic diseases of the heart, and angina pectoris. In all these diseases, however, regard must be had to the particular circumstances of the case in question.

As to the proper number of meals to be taken in disease in the day, the proper hours for taking them, and the quality and quantity of the materials of which each should consist, these of course must be left to common sense, assisted by common experience. There is reason to believe, however, that the injunction so generally given to invalids to eat little and often, is in general a very pernicious one, no time being thus allowed to the stomach for recovering itself, and thus giving rise to a healthy appetite, and consequently a good digestion. It is probable, too, that the fullest meal, by whatever name it be called, should be taken much earlier in the day than is the common practice, chiefly for the purpose of avoiding throwing an additional stimulus upon the body at a time when it is naturally most excited. But however this may be, there can be no question that regularity in the succession of the meals is of essential importance; and the common rules of allowing exercise to precede rather than follow a meal, of eating slowly, &c. need not be here reiterated.

The employment of the passions as a remedy of diseases is seldom practicable, and may be occasionally hazardous, though it cannot be doubted that they are as powerful in recovering as in occasioning disorders.* It need hardly be observed that there are

* The observation, that the earliest remedies, exclusive of external applications, were dietetical alone, was meant to apply only to those employed by physicians properly so called, since it must not be for-

few disorders in which peace of mind is not advisable; and it is particularly so in the second stage of fevers, in hypertrophy and aneurism of the heart, and aneurism of the arteries in general, in morbus cæruleus, and other organic affections of the heart, &c.; but in many a state of general hilarity is of still greater service. This is said to be particularly the case in scorbutus, jaundice, scrophula, dyspepsia, chlorosis, and some species of insanity, and hence perhaps in these diseases the principal advantage of a change of scene and society. In order to suppress too violent contractions of the womb during delivery, it is allowable sometimes to excite a little alarm; and the resistance opposed by muscles to the reduction of a dislocation may often suddenly be overcome by the same means. So also a paroxysm of epilepsy is well known to be often kept off by terror or fear of punishment, and of hysteria also by terror or fear of ridicule; but in the application of the remedies

gotten, that in the history of almost every country there has been a period in which medicine was in the hands of priests, whose chief remedies were such as could work only by means of the passions of their votaries. This is sufficiently well known to have been the case with the Greeks and their temples of Æsculapius at Cos and at Pergamus, and the Romans and their sibyls, among whom, for a long time, the principal means of removing diseases was by propitiations, sacrifices, and religious ceremonies; and similar means were resorted to by the Druids, the first physicians of their Gothic successors, and are still universally adopted by the Magi of Persia, the Brahmins of India, the Tahouas of Otaheite, and the priests, by whatever hard name they are called, in almost all other barbarous or semi-barbarous nations. It was by means of the passions, likewise, that the various charms and spells in every age, more or less trusted to in the cure of diseases, and so seductive to weak and uninformed minds, could have any effect, or continue to be used.

great discretion is necessary. It is probable that to this head animal magnetism, metallic tractors, and all the remedies the operation of which seems to depend upon the faith of the patient, should be principally referred.

As exercise is one of the best means of preserving health, so it is one of the best remedies in many diseases. Although the ancients, from their ignorance of the circulation of the blood, must have been quite incapable of explaining the good effects of exercise, yet their experience of its utility was sufficient to procure for it the principal rank among their remedies. The introduction of gymnastic exercises as a means of promoting strength is ascribed to Hercules (Pliny, vii. 56); and the memorable Olympic and other games of the ancients are universally known. Gymnastics were however systematically employed for the treatment of disease for the first time by Herodicus, the predecessor of Hippocrates; but from his having been too indiscriminate and violent in their use, the practice fell into some disrepute, till it was revived by Asclepiades, who, among other things, invented swinging beds or cots, and appears to have been the first extensively to employ friction. The dumb-bells, or something very similar to them, called halteres, seem to have been the invention of Artemidorus, although they are recommended in the papers of the Spectator as something quite new. Percussion is mentioned by Celsus. By Galen, Ægineta, and others, almost all the species of exercise above enumerated are mentioned, as well as some others of which we have at present little idea, and among the rest that of the cricoëlasia, probably something similar to the velocepede,

which a few years ago was so fashionable among us, and which, with such characteristic velocity, ran through its career. Another favourite exercise among the ancients, which has become obsolete, was reading aloud, and shouting; a practice well enough adapted to nations of orators, and people among whom it was no mean praise of a hero to be βοηναγαθος, or good at bawling. In the second stage of fever, and in inflammation in general, exercise is manifestly improper, as well as in diseases of the heart and aneurism of the arteries; but in a tendency to polysarcia, gout, and sanguineous palsy and apoplexy, it is one of the best prophylactics; in mild rheumatism, chronic palsy, and in nervous apoplexy from narcotic poisons, &c., and dyspepsia and chlorosis, it is one of the best curative measures. Exercise is often divided, though with very little advantage, into active, mixed, and passive. To the first belong walking, leaping, skipping, dancing, and running, skaiting, swimming, swinging, the use of the dumb-bells, boxing, fencing, rowing, playing at athletic games, &c.; to the second, riding on horseback, riding in a carriage, sailing (used principally in phthisis), swinging (used both in phthisis and insanity), percussion, shampooing, friction, &c. It is quite superfluous to subjoin any rules for the regulation of exercise; it is sufficient to say that it should be taken regularly, and, as has before been observed, should rather precede than follow a meal; and it is sufficiently obvious that it should not be carried so far as to excite excessive fatigue.

CHAP. II.

MEDICINES.

CLASSIFICATION OF MEDICINES—THIS NECESSARILY IMPERFECT—MODE OF ADMINISTRATION—ANCIENT WAY OF ADMINISTRATION—MODE OF ACTION OF MEDICINES—VARIOUS HYPOTHESES ON THIS SUBJECT—EVACUANTS—REVULSION—EXPLANATION OF HIPPOCRATES—METASTASIS—CRITICAL DISCHARGES—COUNTER-IRRITATION—HOMŒOPATHIA—[HISTORICAL SKETCH OF HAHNEMANN AND HOMŒOPATHY.]

The medicines commonly employed in the treatment of diseases are derived from all the kingdoms of nature, and may be conveniently classed according to the particular effects which they in general produce, as the classes may be further arranged in the order of the organs on which they appear more particularly to act. The chief classes of medicines commonly mentioned are, the *errhines*, acting principally upon the nostrils; the *sialagogues*, upon the salivary gland; the *demulcents* and *expectorants*, upon the lungs; the *emetics*, upon the stomach; the *purgatives* and *carminatives*, upon the intestines; the *diuretics*, upon the kidneys; the *emmenagogues*, upon the womb; the *diaphoretics* and *epispastics*, upon the skin; the *astringents*, upon any of the foregoing organs; and the *stimulants*, *tonics*, *antispasmodics*, *sedatives*, and *narcotics*, upon the spinal marrow and brain. The *antacids* and the

anthelminthics, which act, the former in neutralizing acid matters in the stomach, and the latter in killing intestinal worms, cannot be referred with propriety to any particular organ.

The above classification of medicines, like that of poisons, though convenient for practical purposes, and to a certain degree precise, is at the same time quite artificial, and in a much greater degree indefinite and arbitrary; to say nothing of the long and violently agitated question as to the primary, stimulant, or sedative operation of certain medicines, which is, as already observed with respect to the exciting causes of disease, a matter of little or no importance, but which, according to the different views which any two persons might choose to take of it, would appear to justify them in placing the same medicines under two diametrically opposite classes.* There are various medicines, as ipecacuan, asafœtida, digitalis, opium, antimony, mercury, &c., which, without any sophistry or ratiocination, may be with

* It has been already remarked, under the head of exciting causes of disease, that every positive agent upon the body, and consequently every medicine, is in all probability primarily a stimulant; the more permanent operation of some, however, being at one remove, and of others at two. This was the doctrine, first of Tralles, with respect to narcotics, and afterwards, with respect to all medicines, of the celebrated John Brown. But from this doctrine the modern Brunonians of Italy, Rasori of Milan, Tomassini of Bologna, Borda of Pavia, and others, recede, contending that some medicines, which they call, not sedative, but contra-stimulant, directly repress action; and the same doctrine is maintained in Germany by Horn, Bertele, &c. with respect to their negative stimulants. The subject however is not worth half the trouble which has been bestowed upon it, since it is the permanent, ot the temporary or primary effect of a medicine, that we have any great interest in understanding.

equal propriety referred to almost any class. Thus, ipecacuan, according to the quantity given, and other circumstances, is either an expectorant, an emetic, a purgative, a diuretic, a diaphoretic, a tonic, or an antispasmodic; and opium may be given to fulfil not only very different, but directly opposite indications, as that of opening the bowels in colic, and of binding them in cholera, although opium correctly belongs to the class neither of purgatives nor astringents. Digitalis, in ordinary doses a diuretic, suppresses the secretion of urine when given in large doses; alum, also, a generally admitted astringent, in large doses purges. Something similar may be said of almost every medicine, but it will sufficiently appear, from these examples, how abortive any attempt must be to make a precise classification of medicines on such principles, and how essential it is to study the action of each in detail, without being much influenced by the place which it occupies in generalizations which nature refuses to acknowledge.

Medicines, whether solid, liquid, or aeriform, may be either snuffed up by the nostrils, or applied to the eyes, as collyria, or by chewing, fumigating, gargling, rubbing into the gums, &c.; to the mouth, or inhaled by the lungs, or even injected into those organs by an opening in the trachea; or injected into the rectum as a clyster, or inserted into it as a suppository; or injected into the urethra or vagina; or applied to the skin in the form of fomentations, poultices, lotions, baths; or introduced through the skin by friction, or by continual contact applied to a blistered surface; or inserted into a wound; or, lastly, injected into a vein; and whatever way a medicine is introduced into the

body, its operation is still, for the most part, like that of a poison upon one and the same organ.* Thus, mercury is an equally certain sialagogue in all the

* The most ancient way of administering medicines is probably by the skin, combined with oil, the extensive use of which in ancient times was so universal. The custom also so common among the ancient Egyptians and their successors, of burning resinous and aromatic substances, as well in their religious ceremonies, as for the purpose of purifying the air, would soon give rise to fumigation by the mouth (as in smoking) and inhalation by the lungs; and accordingly we find that both the Egyptians and Greeks prescribed the vapours of bitumen, pitch, sealing-wax, sulphur, and similar substances, in diseases, not only of the fauces, but of the lungs; a practice revived in 1654 by Bonnet, and continued by Willis, Mead, and many others, down to the time of Sir Alexander Crichton.

Similar fumigations were often formerly employed by the vagina, as emmenagogues, &c. The administration of medicines by the mouth is said to have been suggested to the Egyptians by dogs and asses, the former of which were observed to take grass as a vomit, and the latter the pulp of cassia as a purge, as often as their constitution required this relief; and the use of clysters among them is reported by Herodotus to have been merely an improvement upon the practice of the ibis, who was in the habit, when in the water, of clystering itself with its beak! The use of masticatories or local sialagogues has from time immemorial been prevalent in all warm climates as a luxury; sometimes the betel leaf, at others quicklime, being employed in this way, and they would of course be used sometimes medicinally; and although we do not hear of the habitual use of any kind of snuff before the introduction of tobacco—and indeed the old prejudice against blowing the nose was incompatible with such a practice—we know that errhines and some kinds of antispasmodics administered by the nostrils were favourite remedies with Hippocrates. In like manner, gargles, suppositories, injections—at least by the vagina—baths of medicated water or oil, and general fumigation of the body with sulphur, and with various other substances, were in common use with the ancients, together with certain other practices now never heard of, such as that of applying medicines to the eyes, or pouring them into the ears, noticed by Aræteus, Cælius, and others: the latter practice has been commemorated by the play of Hamlet.

various ways in which it is administered; the demulcents, expectorants, diuretics, and such other medicines, act equally specifically on the mucous membranes, kidneys, &c. though received into the stomach, or introduced through any other foreign channel. Tobacco and white hellebore act as emetics when applied to the skin, or introduced by the anus; black hellebore, colocynth, gamboge, antimony, &c., as purgatives, when either snuffed up the nostrils, applied as collyria, handled for a considerable time mixed with a blistering plaster, or inserted into an issue; and cantharides as an astringent, whether swallowed or applied to the skin; and that the specific effects of any medicine may be produced by inserting it into a vein, is now very generally known. It follows from these facts, that in explaining the mode of action of medicines in general,* we should dwell not so much on

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* The notion of the ancients with respect to the mode of action of medicines are unworthy of being remembered, except as an example of the absurdities into which men are betrayed by a close adherence to favourite systems. It had been established, that of four elements, each distinguished by a certain essential property,—as dryness, moisture, coldness, and heat,—every thing in nature was composed; and that of certain definite combinations of these elements were formed the four principal fluids of the body; that an inordinate general prevalence of one or other of the fluids constituted the four temperaments (see p. 18); and that as an ακρασια, or preternatural accumulation of one or other of these, constituted organic diseases in general, so a change in the essential properties of some one of the tissues constituted such diseases as were functional alone. Now, in repairing this loss of balance in any part, whether of its fluids—attended of course by a change of their leading properties—or of its properties alone, it followed that substances must act, either by neutralizing those properties which were superabundant, or supplying those which were deficient; and hence arose

the means by which they reach the organ on which they act, as on the *specific nature of their stimulus*,

the theory, that every medicine that was a remedy for dryness was moist, for moisture, dry, and it might be either the one or the other, and at the same time either cold or hot, and each of these in either the first, the second, the third, or the fourth degree. For this reason it was the leading or cardinal property of the medicine which determined its sensible operation; emetics, for instance, going upwards because they were hot, purgatives downwards because they were cold, and each attracting forth such humours as were most allied to itself! These doctrines, after the revival of literature, gave way to views generally either exclusively chemical or exclusively mechanical, medicines being supposed to operate each in its own way, either according to its particular affinities, or, as they were then called, sympathies and antipathies, or according to the size and form of its particles; and it was not till after Hoffmann had shewn that the exciting causes of diseases operated always on the nervous system alone, that the action of medicines also began to be referred to the same system. Still much of the old chemical and mechanical leaven continued to prevail in the common theories on the subject, and this equally whether a medicine were brought in contact with the organ affected, or reached it by means of the blood, which for a long time seemed the only two conceivable methods by which it could produce its effect. Thus a common explanation of the salivation produced by mercury was, that the medicine being taken up by the blood, either combined with the salts of the latter, and thus attenuated it, or did so by mere admixture, and thus a portion of the blood was adapted to be strained through the salivary glands, or that it passed off by these glands, because the urine, containing phosphoric acid, which forms an insoluble compound, refused to transmit it; and that of antispasmodics, that, operating on the heart as a simple stimulus, they produced so increased a flow of blood through the whole body, that the local congestion, on which the spasm was supposed to depend, was thereby as it were *washed away*. When a medicine was neither directly applied to the organ on which it acted, nor could be conveniently supposed to be taken up by the blood, it was either stoutly denied to have the power attributed to it, or was sometimes conceived to operate by contiguity; and it was on the principle of contiguity of the heart and throat that the stimulant effects of antispasmodics just mentioned, and on that of the lungs and sto-

which, however conveyed, produces the same effects. It has been already sufficiently shewn that every organ of the body has a peculiar kind of irritability, adapting it to be acted upon by certain stimuli more remarkably than by others; and that it is owing to this peculiar susceptibility in certain organs, of certain impressions, that particular exciting causes, *e. g.* contagions, however applied, produce always particular diseases; and precisely the same explanation must be

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mach that those of expectorants, that of the womb and rectum that those of emmenagogues, &c. were generally explained; while at other times still greater ingenuity was called forth, as in ascribing the effects of local sialagogues merely to the compression of the salivary glands by mastication, and those of demulcents to their smearing the surface of the larynx during their passage into the stomach, so that the frequency of the cough being diminished, more time was allowed for the inspissation of the excreted mucus; and it is only very lately since the influence of those purgatives which operate chiefly on the smaller intestines was ascribed to their more rapid, and those which operate chiefly on the larger to their more slow solution in the intestines, quite overlooking the fact that a great number of the substances never pass the pylorus at all. But how extremely vague and inconsistent these notions are, and how irreconcileable are some of them to the fact, that certain medicines operate for the most part on certain organs, and in a certain manner, however and whenever introduced, is sufficiently obvious. The luminous doctrines of Brown as to the nature of the changes which constitute disease, aided by those of Bordeu with respect to the specific irritabilities, and by the general character of the easier explanation of the sympathies by which certain irritations of almost any one part may be conveyed to almost any other, have introduced much clearer views of the action of medicine; and though the experiments of Magendie, Brodie, and others (see p. 108), have rendered it probable that many, if not all medicines, as well as poisons, may be taken up by the blood, and thus indirectly produce their effects, such a circuitous mode of action seems to be no more necessary to the operation of medicines than to that of exciting causes of disease.

given of the more or less specific action of all medicines. Not only every class of medicines, but every individual medicine, may be with great reason presumed, like every other agent, whether salutary or deleterious, to afford a stimulus more or less distinct from that afforded by every other. When received into the body, therefore, in any way, each will be comparatively inert with respect to all those organs to the peculiar irritability of which this stimulus is not adapted, and will act only or chiefly on those which are calculated to feel it, and this equally whether the medicine operate directly on the latter, or, applied to some other organ, produces there such an irritation as, being conveyed by certain nerves to the organ upon which it is more properly to act, brings about its specific effects, in other words, operates by sympathy;* and the numerous examples of increased secretions, and of other inordinate actions already recorded as effected by mere sympathy, without any suspicion of an altered condition of the blood, or any other change, may well justify us in supposing, that when medicines are applied otherwise than directly to the organs to be acted on, though they may sometimes be taken up by the blood, and thus operate in the same way as when injected into a vein, yet that they may and usually do produce their effects in the former way alone.

Evacuants.—The effect of all medicines by which discharges are promoted seems to be that of stimulating preternaturally, in the first instance, the capil-

* That this is the case with many astringent medicines, is sufficiently obvious from the thrill felt throughout the whole body on taking any thing intensely sour into the mouth.

lary arteries of the organ (if a conglomerate gland, at the radicles of the ducts) whence the evacuation is to proceed; and this inordinate irritation being succeeded, sooner or later, by a proportionate collapse—a state analogous to inflammation, and a consequently increased or altered secretion, are the result.* It is sufficiently well known, however, that the quantities of medicines required for producing evacuations are considerably greater in cases where the agency of the brain is suspended or perturbed, as in sanguineous palsy, apoplexy, insanity, catalepsy, and tetanus, the constant stimulus derived from this organ being apparently always conducive, and sometimes almost essential, to their operation; and it has accordingly been observed that the action of such medicines may be suspended by compressing the brain. Medicines of this description are employed sometimes as emmenagogues, purgatives, and diaphoretics, to promote the natural secretions by any means impeded; at others, as demulcents and expectorants, to change the nature of such secretions; at others, as emetics, purgatives, and carminatives, to relieve certain organs from a foreign load; and at others, lastly, as emetics, purgatives, diuretics, errhines, diaphoretics, and epispastics, to operate by revulsion; in other words, when an organ upon which we cannot immediately act is affected with inflammation or

* It is common here, as elsewhere, to talk of increased determinations of blood, as if it were by this means that increased discharges were effected. Independently, however, of the improbability of such increased determinations of blood ever taking place, they are obviously quite unnecessary in these instances, every organ, even in the natural state of its secretion, receiving perhaps two or three hundred times more blood than is employed in secreting.

its consequences (the former depending, as has been already said, upon the preternaturally relaxed state of its capillary arteries), to bring about an irritation in some distant part, which, being conveyed by sympathy to the organ primarily affected (in the same way as the irritation attending the renewed irritability of the vessels after inflammation excites the evacuations called critical), stimulates its vessels to a healthy action, and thus diminishes or removes the disease. The doctrine of revulsion is as old as Hippocrates, and the attempt to cure inflammation and other diseases by promoting evacuations from distant organs was founded upon the observation of critical discharges, by which such diseases seem to be frequently suddenly resolved, or which at least attend their resolution. Of course, the benefit derived from the practice was at first explained upon the idea of a translation of a peccant matter, or of the fluids called into play to expel it; but as it was soon noticed that remedies called revulsive frequently produced equally good effects, although unattended with any discharge, it became necessary to establish it as a law that two morbid impressions could not subsist together in the same body, so that a secondary and stronger one being promoted, the primary or weaker one necessarily ceased. "Δύο πονων," says Hippocrates, "ἅμα γινομένων, μὴ κατὰ τὸν αὐτὸν τόπον ὁ σφοδρότερος ἀμαυρει τον ἑτερον;" (Aph. ii. 16); and this assertion, gratuitous as it certainly is with regard to irritability, which has many seats, however well founded it may be as to sensibility, which has but one seat, has been since received almost *nem. con.* as an axiom; and so long as inflammation —to take this as *instar omnium*—was considered to

consist of increased action in the part affected, it was no doubt an extremely convenient one, and, together with that of the increased discharges, or, what amounts to the same thing, the new "determinations of the blood," has furnished the chief modern explanations. But inflammation is at present generally understood to consist, not in increased, but in diminished action, so that our explanation of the benefit derived from revulsive remedies must be *toto cœlo* different, and, as before observed, must be founded on the presumption that they communicate, and do not abstract, a stimulus. This doctrine, however staggering it may be found as opposed to preconceived opinion, is perfectly reconcileable with every unprejudiced view of the question, and either must be adopted, or the whole modern theory of inflammation be entirely abandoned. In speaking of the termination of inflammation by resolution, it was described as depending on a spontaneous, more or less sudden, return of the inflamed vessels to their state of healthy irritation, which, acting now as a new stimulus by sympathy upon certain vessels at a distance, produced at first increased irritation in them also, which irritation being in them preternatural, is followed sometimes by a more or less permanent collapse (whence arises metastasis, or a new inflammation), at other parts, first by collapse, and this speedily followed by increased secretion (whence arise critical discharges). Metastasis and critical discharges, then, are the consequences, not the causes, of the termination of the inflammation, or the re-establishment of the natural irritation; but when, during any primary inflammation, or the want of this natural irritation, in one

part, we excite such an irritation as is necessary to produce elsewhere either another inflammation or its consequences, this new irritation, extended by sympathy to the original seat of disease, brings it not *beyond*, but up to the line of health, and recovery is the consequence. Nor is it in inflammation alone that we use revulsive medicines, but in functional diseases of diminished action, as asthma, syncope, dyspepsia, amaurosis, nervous apoplexy, local palsy, &c. where their beneficial operation can be explained only by presuming them to be not abstractors, but communicators of irritation. It is true, here the diminished action of distant organs seems to arise from the diminution of the stimulus of the brain, and this implies a constriction, not a relaxation, of the capillary arteries of the gray matter; but this relaxation can be effected only by inducing previously a still farther constriction of these arteries, to such a degree as is incompatible with its long continuance, so that in these cases also the action of revulsion must be at least primarily decidedly stimulant; and with respect to inflammation, what in fact must be the only two principles on which we can with any degree of reason or consistency administer remedies at all, consisting, as this affection confessedly does, in a loss of balance between the weight to be moved and the moving power? Must they not be either to diminish the former, or to increase the latter, or (as is usually done) to effect both ends together? If a horse is unable, with the ordinary exertion, to move under the load imposed upon him, there are but two means of getting him forward, that of removing a part of the load, which may be by itself sufficient, and that of stimu-

lating him to greater exertion, which may likewise be alone sufficient, but each will be more effectual, of course, if combined with the other.

The same is the case with the capillary vessels in a state of inflammation: we diminish the load of blood by blood-letting, general and local, and if this will not do *per se*, or even without this sometimes, we stimulate the vessels to contract upon their contents, and the inflammation subsides.* It is absurd, then, to continue to talk of counter-irritation, in the sense at least in which the word is generally used, to signify the withdrawing an irritation from an inflamed part by exciting an irritation in another. There is no known law in the animal economy which justifies us in supposing that such is ever the case, and if it were, the remedy would infallibly increase instead of alleviating a disease consisting already in a state of minor irritation. But, independently of all theory on the subject, what are the conclusions to be drawn from every-day experience? When the seat of the inflammation is one to which we can immediately apply our medicines, as in cynanche tonsillaris, gonorrhœa, ophthalmia, and skin diseases, are the most effective gargles, injections, collyria, &c. usually such as excite, or such as depress? and are the other direct remedies to which we have recourse with the greatest benefit in deep-seated inflammations, such as heat, electricity, acupuncture, &c. of a stimulant or sedative character? Now is it not absurd, when we *see* that the *direct* re-

* It is remarked by Hunter, "if we had medicines which were endowed with the power of making the capillary vessels contract, such, I apprehend, would be the proper medicines in inflammation;" and such, we feel satisfied, are the medicines which we call revulsives.

medies of inflammation are always such as to communicate, not withdraw, irritation, to continue to *presume* that the *indirect* remedies, or reputed revulsives, such as emetics, purgatives, diuretics, errhines, sialagogues, diaphoretics, and in particular epispastics, are such as to withdraw, not communicate it? They all obviously act in the same way, and the effect of each class of revulsives, in bringing the action of the dilated capillary vessels of each organ up to the line of health, will of course be great or inconsiderable, in proportion as the specific character of the new irritation is well or ill adapted to the specific irritability of these vessels, and as the sympathy which subsists between the organ to which the revulsive remedy is applied, and the seat of the primary irritation, is intimate or the reverse.

Now, from what has been said, it must follow that almost any remedy, whether direct or indirect, which is competent to remove, not only inflammation, but most other diseases of diminished action, when they already exist, must be very apt to produce such diseases when they do not, the only difference consisting in this, that the irritation which they occasion is in the former case healthy, and in the latter morbid; and if these views be adopted, we shall be prepared to receive, with less repugnance than some persons who are obviously incapable of appreciating it, have thought proper to display, the theory proposed in 1810 by Hahnemann, under the name of Homœopathia. According to Hahnemann, any agent which is capable of exciting a disease or symptom, is of all others that which, when such disease or symptom exists, is best adapted to remove it. Contrary

to the antipathic dogma of Hippocrates, and almost all former writers, "contraria contrariis," the homœopathic axiom is, that "similia similibus curantur;" and as in former times cold was regarded as the best remedy for the ills produced by heat, so, according to the homœopathists, heat is the best remedy for all the ills which heat occasions. Nor is this doctrine, although as gravely and collectively set forth it has a very paradoxical aspect, by any means a new one; but, on the contrary, it has been promulgated in isolated instances from the earliest times, and is accordingly inculcated, not only in our best classical productions, but even in our nursery maxims—a fact which of itself furnishes at least a presumptive proof of its origin in experience and observation, and not in hypothesis. Homer is said to have alluded to it when he describes the spear of Achilles as the only remedy for the wounds which his spear had inflicted; and Ausonius distinctly embraces it when, in speaking of the attempt of a lascivious woman to destroy her husband, he describes poisons as antidotes for diseases which poisons had occasioned,—

> "——— Prodest crudelior uxor
> Et cum fata volunt, vira venena juvant."

So, also, among the precepts of the Schola Salanituria, we find various potations recommended as a means of remedying drunkenness:—

> "Si noctura tibi nocet potatio vini
> Hoc tu mane bibas item et."—*Medicina.*

Shakspere alludes often to the same principle,—

> "Take thou some new infection to thine eye,
> And the rank poison of the old will die."

Butler remarks,—

> "Thus wounds by wider wounds are healed,
> And poisons by themselves expelled."

But, independently of such authorities as these, every day's experience furnishes us with examples of the truth of the homœopathic doctrine, at least in some instances, the several substances operating in producing and curing each its own class of diseases, sometimes directly, and at others indirectly, or by sympathy. Do we not continually give *purgatives* in the cure of diarrhœa? as is erroneously supposed, for the purpose of carrying off some offending matter, the presumed cause of the discharge: and how often is *aloe*, one of the most common causes of piles, a means of effectually removing them when already present? Among the diuretics, also, cantharides, as well as the turpentines and balsams, are not more effectual in removing gleet and catarrh of the bladder when present, than they are under other circumstances in occasioning them; and, among the diaphoretics, *tartar emetic* has, according to our own personal experience, excellent effects in stopping a diaphoresis, effectual as it is, as everybody knows, when no such affection exists, in exciting it. The sweating-sickness was treated formerly by diaphoretics. Further, among the tonics, *cinchona*, the chief remedy of intermittent fever when present, is said to be capable of producing this when not; and it was indeed from noticing this effect upon himself, that Hahnemann was first induced to prosecute and systematize the theory in question. Tartar emetic, also, in large doses (when it is rather to be considered a tonic than either

a nauseant, a diaphoretic, or a sedative), which, as every one knows, is one of the most efficacious means of combating inflammation in general when it exists, is almost equally sure to produce it when it does not. But the medicine which is most illustrative, in its various operations, of the truth of the homœopathic doctrine, is *mercury*. The occasional effects of this mineral in producing laryngitis, iritis, ptyalism, and numerous other inflammations and their consequences, are abundantly well known; and what remedy is so effectual in removing, as generally acknowledged, the two former, and, as not long ago proved by Duncan and others, the latter also. Nay, the effects of mercury in curing lues venerea are dependent probably upon its power, where no such disease exists, of producing one, if not identical with it, certainly very similar, in its specific effects upon the throat, skin, bones, and other organs, to the one in question. Lastly, among the narcotic medicines, the effects of alcohol in removing as well as exciting delirium tremens in all its degrees have been already alluded to, and are sufficiently well known. But not only medicines, but other remedial agents, furnish equally conclusive evidence of the truth, in certain cases at least, of the homœopathic doctrine. Thus, what is the blacksmith's remedy when he has scorched his finger? is it not holding it again to the fire, for the purpose, as he expresses it, of drawing out the heat? And what is Dr Kentish's treatment of burns in general? is it not by heated oil of turpentine and other stimulant applications, for the purpose, as he presumes, of bringing the inflamed part gradually, not suddenly, down to the line of health? This is not the true ex-

planation of the benefit so derived, but the benefit is nevertheless unquestionable. Again, the occasional effects of *electricity* in removing amaurosis, palsy of the tongue, &c. are no less certain than that these diseases have often resulted from the same cause; and its effects in either producing or removing nervous apoplexy, according to circumstances, were beautifully illustrated on one occasion by the late Dr Currie, who found, that by passing an electric shock through the head of a rabbit, he could alternately stupefy and revive it for almost an indefinite number of times. Many other examples of a similar nature might be adduced, but it seems unnecessary to multiply instances of a fact which every unprejudiced mind must admit, that the same agent, under different circumstances, may, at least frequently, either cause or cure any given morbid affection. Now, how is this fact to be explained? Hahnemann's general notion (although he has obviously at times a glimmering of the truth, which is not easily reconcileable with this notion) is, that such substances operate in producing a stronger impression, and thus superseding the weaker; but this is nothing more than the old σφοδρότερος axiom of Hippocrates. It is not in this way that homœopathic remedies operate, but by stimulating to increased action the seat of disease.

With respect to diarrhœa, piles, gonorrhœa, and catarrh of the bladder, diaphoresis, intermittent fever, laryngitis, iritis, ptyalism, and burns, the essence of all is inflammation; and how readily the same substance which at one time may produce, at another may cure it, will easily be perceived. It is unnecessary to speak of the action in producing and curing the same

diseases, of those substances which act *directly*; but let us take, as somewhat less obvious, that of some indirect agent in the same way, as that of mercury, one of the most generally admitted among the above-mentioned examples, in at one time producing and at another curing iritis. In the healthy state of the capillary vessels of the iris their calibre is natural, because the stimuli acting on their irritability are neither deficient nor excessive; but the irritation produced in certain parts of the body by mercury is a new stimulus, specifically adapted to the irritability of these vessels (in common with those of many other organs), so that, conveyed to these by sympathy, it excites there a secondary inordinate irritation or contraction, followed sooner or later by a proportionate collapse, in which the inflammation consists. Now, what substance should we *a priori* conceive would be best adapted to bring up the vessels to their ordinary degree of contraction, and thus to discuss the inflammation? Any revulsive remedy (as we cannot get at the part directly) may be presumed capable of doing this to a greater or less degree; but unquestionably that will be most efficacious which has already evinced a specific power of exciting in one part such an irritation, as, conveyed by sympathy to the vessels of the iris, could excite them to inflammation, and which, as it produced, while they were healthy, a preternaturally increased action, followed of course by collapse, will, now that they are acting below par, bring this action to the healthy standard, from which they will have no tendency afterwards to recede. Hahnemann is quite aware of this two-fold action of medicines, and it is to insure their primary, without fear of their secondary

action, that he inculcates the expediency of giving them in inconceivably small doses. But it is absurd to say, as he at the same time does, that medicines in such doses operate by producing a stronger impression than that produced by the disease. They cure it, not by the *stronger*, but by the *opposite* impression which they make; so that homœopathic medicines, after all, operate on the antipathic principle. If we choose to represent the ordinary irritation of the vessels of the iris by a longitudinal line, say an inch high, it is easy to conceive certain substances capable of raising it to an inch and a half; but this height, as it cannot be maintained, after a time is reduced spontaneously through double the space that it has been raised, *i. e.* falls as much below an inch as it had been before raised above it, or to half an inch; and what are the substances now called upon to effect, but what they effected at first, namely, to raise the line of action half an inch, the result of which is now health, as it was before disease? We must remember that it is in the secondary or depressing effects of exciting causes in general that inflammatory diseases, at the time we are called upon to treat them, consist; and there is surely nothing absurd, but, on the contrary, every thing reasonable, in the presumption that the same exciting cause, in such a manner or at such a time, applied as to insure their primary or exciting effects, will act as the best remedies of those diseases which, under other circumstances, they may have occasioned. And what is true of the inflammatory diseases is equally so of those functional disorders which have been above enumerated, delirium tremens, local palsy, nervous apoplexy, amaurosis, &c., with this dif-

ference, that it is in the primary action of the exciting cause that the disease now consists, and by the secondary that it is removed. Let us take, for example, Currie's experiments on rabbits: electricity binds up the capillary arteries of the gray matter, and the influence of the brain is cut off; but the constriction, though it would sooner or later be followed by collapse, may, from being moderate, last for a considerable time. What, then, does now a repetition of the same cause produce? Why, it binds up the vessels to a degree which is incompatible with this state; collapse instantly follows, and healthy action is the result. But if this be the case, it may be urged, why are such substances as have produced any given disease only sometimes, not always, effectual in removing it? We answer, that this depends probably, not upon a deficiency in the principle, but upon our incapacity to make a full and constant application of it. It may be quite true that any agent which is capable of exciting a disease is the one best adapted, where it exists, to remove it. But are the susceptibilities of different bodies and parts of bodies so uniform as to enable us to say that an agent which in one produces, and therefore cures, any given disease, shall produce and cure it in another? or are the effects of different substances, as modified by their doses, and other circumstances in their administration, so constant as to enable us to insure, in any given case, the primary or secondary action of each, as necessity requires? In some cases there is a sufficient uniformity, perhaps, in all these respects, to enable us to proceed with confidence, but in the majority there certainly is not; and hence the homœopathic doctrine, beautiful as it is in theory,

is perhaps in general inapplicable to practice. It is quite undeserving, however, in general, of the would-be wit and ridicule which some worthies have thought proper to discharge upon it. Hahnemann is wrong in his unqualified censure of the antipathic remedies; the only difference between which and the homœopathic is, that the former in general do good indirectly, the latter directly; but both are in fact antipathic, in as far as they do good at all. He is wrong also in his general explanations of the benefit derived from the latter, and he is frivolous in the extreme in the host of symptoms which he enumerates as excited by each individual medicine (495 for chamomile flowers), and in the minuteness of the doses which he inculcates (octillionth of a drop of the tincture of colocynth); but even this is not so palpably absurd as some persons have chosen to represent it, since we all know that very violent effects frequently result from even a smaller dose of musk and other perfumes; and, upon the whole, Hahnemann's book is an original and interesting one, and displays more reflection in every page than many of his decriers will evince in the whole course of their life and conduct for half a century.*

* [The increasing interest that homœopathy is acquiring renders it expedient, as we think, to complete the subject by giving a brief abstract of the history of its progress, which, to insure its impartiality, has been abridged by a friend from Sprengel's History of Medicine, as continued by Eble, in whom Hahnemann has found at once a determined opponent and impartial historian.—(See Curt Sprengel's Versuch einer pragmatischen Geschichte der arzneikunde fortgesetzt von Dr Burkard Eble, &c. Wien, 1840, p. 90.)

Samuel Christian Friedrich Hahnemann (born at Meissen in 1755) having pursued his medical studies at Leipzig and Vienna,

took the degree of doctor in medicine at Erlangen in 1779; and not long after he was appointed physician at Gommern near Magdeburg. It was here that, apparently under a strong impression of the defects of medicine as hitherto practised, out of conscientiousness (aus Gewissenhaftigkeit) he for several years entirely gave up its practice, and devoted himself merely to literature and chemistry. Most of his chemical labours (of which some have immortalized his name) were pursued between the years 1777 and 1790. After this he was much occupied in the translation of the works of English and French authors. It was in the year 1790, while he was engaged in translating Cullen's Materia Medica, that the theoretic explanation of the antifebrile principle in cinchona was suggested to him, on which he resolved to establish by experiment whereon rests its power to cure intermittent fever. After having previously found that strong coffee, pepper, wolfsbane, St Ignatius' bean, and arsenic, have the property of exciting a kind of fever, he conjectured that a substance can serve as a remedy only by producing symptoms which resemble and correspond with those which the disease exhibits. Accordingly he made the first trial on himself, by taking for some days four scruples of powdered cinchona twice a-day, and observed the symptoms which mark a well-developed intermittent fever.

Hahnemann again applied himself to practice, and following the homœopathic system, and dispensing his own medicines, was driven, by the persecution of other practitioners and druggists, in succession from Königslutter and Hamburg, and returned to Saxony. It was in 1796 that he published the first results of his discovery. These experiments he made with the usual doses, and observed that the cure took place only after considerable and continued aggravation of the symptoms, which obliged him to reduce the doses. He now observed with surprise that the diminution of the curative power, and of the homœopathic aggravation, stood in an extraordinary relation to the reduction of the doses. Upon this he continued the reduction of doses still further, and at last to an inconceivable degree. About the same time he discovered the virtue of belladonna as a prophylactic against scarlatina, and promulgated along with this the doctrine, that remedies must be only given in small quantities. He tried too to establish, that the simple, obvious, and only means of raising medicine to a science, is by a careful observation of the symptoms of the disease, and the application of that remedy which has the power of producing similar symptoms, and hence that the motto, *similia similibus curantur*, was the only sound one. Before the publication of the Organon der Heilkunst in 1810, a separate

work, in which his new principle was fully developed, Hufeland alone had adopted the views of Hahnemann. It was in the Organon that Hahnemann first gave the new system the title of homœopathia, a name derived from his adopted motto, as opposed to the old system, which he termed allopathia. Soon after appeared his second important work, in which are stated the proving, after his method, of sixty medicines—that is, many hundred symptoms of each are given—obtained in part from Hahnemann's own observations, and in part from those of other authors, the effects of these medicines having been all noticed in healthy persons, from which might be gathered their application to diseases.

From 1810 to 1821 Hahnemann remained in Leipzig, where he had a great reputation, and (especially on the prohibition against the practice of homœopathy in Austria) where he was visited by a great concourse of patients—some of them of high rank—among whom was Prince Schwarzenberg. On the death of Schwarzenberg, with whom, as with many others, his treatment was naturally unsuccessful, Hahnemann's reputation, and the crowd which it brought, somewhat abated; and about the same time a prohibition against practitioners dispensing their own medicines in Saxony obliged him to leave Leipzig. In the controversy to which Hahnemann's opinions gave rise (and which it would be out of place here to state particularly), his disciples gradually shewed themselves, and, by the earnest share they took in the further proving of remedies, contributed to the full establishment of the new doctrines. Among these disciples, Moritz Müller, Wilhelm Gross, and E. Stapf, were the most distinguished; and on the other hand appeared Hufeland (styled by Eble the veteran of German physicians), whose subsequent judgment on the practical effects which it might be expected that the introduction of Hahnemann's system would have on the art of medicine it may be interesting here to give, along with the statement Eble makes of Hufeland's views generally on the subject. Hufeland states, *first*, the beneficial; and, *secondly*, the injurious consequences to be looked for.

First, The beneficial consequences to be expected from this system, *i. e.* homœopathy, are,—

1st. This system will make physicians more attentive to the somewhat neglected semiology.

2d. It will make the young physicians more attentive to rules of diet.

3d. It will shake the belief of many physicians on the necessity for such immense doses of medicines as are at present given.

4th. It will introduce more simplicity in the making of prescriptions.

5th. It will lead to a more certain proving and acquaintance with medicines, which it has already done.

6th. It will direct more of the physicians' attention to the preparation of the medicine, and make them keep a stricter watch on the apothecaries.

7th. *It will in no case do positive injury.*

8th. It will give the system more time to rest, and to recover itself, undisturbed.

9th. It will immensely decrease the expense of the cure.

Second, Injurious consequences.

1st. It may be apt to lead the less-educated physicians to a symptomatic treatment.

2d. It will, if universally prevalent, injure the fundamental studies of medicine.

3d. It may introduce most dangerous carelessness.

4th. It would affect the established principles of the present medical constitution, if it be necessary that physicians should dispense their own medicines.

5th. It denies in its principles the efficiency of the vix medicatrix naturæ, and thus opposes itself to the grand dogma of Hippocrates.

In a theoretic view, Hufeland's opinion was, that the homœopathic method of cure corresponds with that which he calls the specific or direct method, and that through the influence of homœopathy this branch of therapeutics would be more attended to, and established upon more certain principles. On the other hand, he protests against it being exalted to the universal and only method, and requires that it should always be regulated by the ascertained proximate cause.

The choice of remedies, too, on homœopathic principles, Hufeland ascribes to accident, and says that the same have been already long in use; and on this ground is homœopathy acknowledged by him, and thankfully welcomed, not as the only principle of medicine, but as one in many cases successful. At the same time he raises well-founded doubts of the sufficiency of experiments made merely on persons in health, as well as of the power of excessively small doses. These words, from one of the most esteemed practitioners of his time, and the circumstance that Hufeland was narrating in his journal cases cured homœopathically, worked very favourably for homœopathy, and brought a multitude of new adherents, as its farther history will shew.

The doctrines of homœopathy, at first confined to Germany, adopted principally by young and practising members of the medical pro-

fession (of whom a large proportion were military surgeons), began to spread to Austria, Naples, Russia, and Poland, and at the end of the year 1825 (when the opinion of Hufeland above quoted was published) had gained much, both in extension and intensity (*intensität*). The number of these adherents daily increased, and the dignity, independence, and courteous dispassionate language which characterized the articles and replies in the Archives, tended much to obtain for homœopathy the consideration and countenance which their scientific contents were thought to merit.

This historical sketch only brings the subject down to 1825, since which time the number of practitioners has greatly increased, and hospitals and dispensaries have been established in various places. Notwithstanding the existence of the laws against homœopathy in Austria, a private hospital was opened in 1832, in the convent of the Sisters of Charity (barmherzige Schwestern), in the suburb of Gumpendorf, in Vienna, where the treatment was and still continues to be conducted entirely on the homœopathic principle. On the approach of the cholera epidemic of 1836, all the hospitals in Vienna were ordered by the government to be fitted up for the reception of patients affected with that disease, among the rest the homœopathic, and the attending physician, Dr Fleischmann, offered to continue his charge, on the express condition that he was to be allowed to adhere to the former mode of treatment. This was agreed to, and an inspecting physician appointed, who attended at the daily visits. The result was, that out of 732 patients received, 488 recovered, and 244 died, being a mortality of 33 per cent., while the average mortality in the other hospitals during the same epidemic was about 70 per cent. In consequence of this, the existing laws against the practice of homœopathy in Austria were repealed.

This year, 1842, another hospital in Vienna, connected with the Elizabethan Convent, containing 100 beds, has been allotted to homœopathic physicians, to be treated upon that principle. A professorship of homœopathy has also been established there by an imperial edict, and two professors are appointed to the situation. In Leipzig also a homœopathic hospital has for some years existed; and after frequent debates on its utility in the Saxon chamber of deputies, an annual sum has been granted by the government for its support. In Berlin a portion of the Charité Hospital is now treated homœopathically, and it is said that another hospital is likewise being established for the same end.

Having paid considerable attention to the question of the applicability of the homœopathic principle to practice, we have arrived at

conclusions somewhat different from, and more favourable than, those deduced from theoretical grounds alone by Dr Fletcher; but as we have hitherto, in the capacity of Editors, carefully abstained from putting forward our own opinions on any subject, we do not feel warranted in deviating from this rule here.]—EDITORS.

CHAP. III.

EVACUANT MEDICINES.

ERRHINES — DEMULCENTS — EXPECTORANTS — EMETICS — PURGATIVES — CARMINATIVES — DIURETICS — EMMENAGOGUES — DIAPHORETICS — EPISPASTICS — ABUSE OF BLISTERS — CAUSTICS.

The *errhines* are useful principally in chronic ophthalmia membranarum, chronic otitis, &c. and amaurosis, while the excitement which they communicate to the respiratory muscles, and the general concussion which they occasion, may be often useful in asthma, asphyxia, and syncope, though it may be very prejudicial in a tendency to hæmoptysis or other hæmorrhages, or to hernia, as well as in abscesses in the heart, or a tendency to epilepsy.

The *sialagogues* are chiefly serviceable in odontalgia and palsy of the gullet or of the tongue. Smoking is said to be a good prophylactic treatment against contagious diseases.*

The *demulcents*, the tendency of which is to thicken

* The use of errhines and sialagogues by the ancients has been already alluded to under the head of the means of administering medicines in general; and that they should be with them favourite remedies in diseases of the brain, &c. was a necessary consequence of the opinions then entertained of the source of the mucilage of the nostrils and of the saliva. They gave errhines in particular την κεφαλην καθαιρειν, using for this purpose principally myrrh and white hellebore, or sometimes peroxide of copper. In modern times they are comparatively neglected.

the discharge of mucilage partly from the mucous membranes in general, but particularly from the bronchia, seem to remove cough, thirst, strangury, &c. by rendering the secretions less acrid, and thus diminishing the irritation whence the symptoms proceed. They are useful principally in the early stage of laryngitis, bronchitis, cynanche trachealis, peripneumonia, and phthisis; in gastro-enteritis, particularly if from acrid poison, virulent inflammation of the urethra, vagina, &c. nephritis, and cystitis.

The *expectorants*, unlike the demulcents, tend to attenuate the discharge from the bronchia by increasing probably the secretion rather of halitus than of mucilage, and thus facilitate the secretion of the latter. They are used chiefly in the latter stages of laryngitis, cynanche trachealis, bronchitis, peripneumonia, and phthisis.

The *emetics* seem to act by increasing and altering the secretions of the stomach, so that this organ being thereby violently stimulated, the necessary muscles are by sympathy called into action, and vomiting is the result. Their action is generally promoted, for an obvious reason, by copious draughts of warm liquids. Emetics given so as to produce their full effects are employed principally in the beginning of fevers in general, when they appear to effect by sympathy what the affusion of cold water effects by contact, viz. first, a constriction, and afterwards such a relaxation of the capillary vessels of the skin as is incompatible with the full formation of the first stage; in ophthalmia membranarum, cynanche tonsillaris, laryngitis, cynanche trachealis, bronchitis, peripneumonia notha, hydrothorax and dropsies in general, phthisis, jaundice from biliary calculi, orchitis, asthma, dyspepsia, chlorosis, &c.

and gastro-enteritis, nervous apoplexy, and palsy, &c. arising from swallowing poison—in all which it is easy to explain their beneficial effects, either upon the principles of their removing a foreign load, whether from the stomach or gall-ducts, or by their expectorant power from the lungs, or of revulsion, or of exciting the respiratory muscles. In nauseating doses, emetics are useful principally in violent appetite, such as occurs principally in diabetes boulimia, and in the second stage of fevers, and in acute inflammations in general, in strangulated intus-susception and strangulated hernia, in preternatural rigidity of the os tincæ, spasm of the sphincter ani, spasmodic ischuria, dislocations, &c., in all which it is required to diminish the stimulus communicated by the brain, not only to the stomach, but to the heart and other muscles, an effect which seems to result from the constriction of its capillary vessels, like the primary constriction of the capillary vessels of the skin, produced by sympathy with the stomach, stimulated to a degree less than is requisite to produce vomiting, and its attendant relaxation of these vessels, or, as it is commonly but perhaps very inaccurately expressed, a *determination* of blood to the head, &c. Emetics are sometimes useful also from the excitement which they afford to the respiratory muscles in asphyxia; but they are dangerous remedies, from the concussion which they occasion in a tendency to hæmoptysis or other hæmorrhages, hernia, abscesses of the heart, &c.; and, from the effect just mentioned upon the capillary vessels of the head, are dangerous in sanguineous palsy and apoplexy, and analogous diseases.

The *purgatives* appear to operate in a manner similar

to that of the emetics, although some of them, as the saline, seem to act principally upon the upper parts of the intestinal canal, and others, as colocynth, on the whole canal, and others, as aloe, on the lower extremity; and the nature of the discharge produced by almost each individual medicine of this class is in some respects different, being very liquid from the saline, and scarcely more so than natural from manna and sulphur, so that they might perhaps, with as much reason as expectorants and demulcents, be treated of under several distinct classes. Like that of emetics, their action is in general promoted by diluents. Purgative medicines are called either laxative, cathartic, or drastic, according to the greater or less quantity required to produce their effects. The tendency of some of them to produce griping, arises from the acrimony of the discharge to which they give rise, by which the muscular coat of the intestines is stimulated to irregular contractions: the tendency is best corrected by warm aromatic substances, which operate as antispasmodics, by diminishing the stimulus sent from the brain.

Purgatives are better adapted in general to infants and children than to those of a more advanced age. They are used to greater or less extent in almost every kind of disease, but more especially in fevers, ophthalmia, narcotism, jaundice from biliary calculi; hæmatemesis, peritonitis, dysentery, hydrothorax and dropsies in general; dyspepsia, colic, amaurosis, insanity, delirium tremens, tetanus, epilepsy, hysteria, chorea, and catalepsy; in all which the benefit derived from them depends upon their removing a foreign load, the source both directly and by sym-

pathy of numerous diseases, or upon their operating by revulsion. In pregnant women, the stronger purgative medicines are improper, from their tendency to excite the permanent contraction of the womb, and thus to produce miscarriage.*

* The use of purgatives among the ancients was habitual, and when we consider the strength of the substances usually employed for this purpose, scamony, white hellebore, colocynth, eleterium, &c., most of the milder purgatives being unknown till the time of the Arabians, it must have been a pretty severe mode of practice. By the earlier physicians the various medicines of this class were fancifully arranged, as cholagogues, melænagogues, hydrogogues, &c., all which distinctions are ridiculed more perhaps than they deserve by Van Helmont, and have been, since the appearance of Dr Hamilton's book, very generally discontinued. In modern times, purgatives were commonly used as general evacuants, till Pitcairn demonstrated how much more might be done in this way by diaphoretics ; but their employment, with one view or another, has been again very general in this country, since the appearance of the works of Dr Hamilton (on Purgative Med. 1805) and Mr Abernethy (Surgical Observations, 1806); and it is amusing to compare the list given by the former of these authors, of the diseases in which purgative medicines are represented as the one thing necessary, with that lately given by some of the Broussaists (albeit agreeing with them in referring these diseases to the mucous membrane of the stomach and bowels), as those in which they are sure to be pernicious in the greater number of all diseases incident to humanity. The French say the English all die of purging, the English that the French all die of constipation ; but it is probable that injury more frequently results from indiscriminate purging, or "keeping the bowels open," as is the common cant, in every conceivable disease in this country, than from the neglect of purgative medicines abroad. It is not easy to say why nature should be habitually more tardy in her operations in this quarter than anywhere else or why it should be necessary to look so narrowly after the *least of the excretions*, while all the rest are allowed to shift for themselves. In ninety-nine cases out of a hundred in which purgatives are of service, it arises, not from their "keeping the bowels open," but by their irritating a part which has a direct sympathy with almost every other, and thus operating by revulsion.

The *carminatives* seem to differ from the purgatives chiefly in producing a less copious secretion of the fluids of the intestines, but still sufficient to excite such an increased action of them as may expel the contained air. They are used only in intestinal tympanitis.

The *diuretics* appear to be quite analogous in their operation to the medicines already mentioned, though this operation is by no means so certain; and there is no class of medicines the action of which is perhaps so much assisted by combining the individual substances of which it consists, either with each other, or with remedies of a generally stimulant character, such as calomel. They in general require likewise a free use of liquids to promote their action, as well as a cold regimen, being apt under a hot one to operate rather by the skin than the kidneys. Diuretics are better adapted to persons advanced in life than to the young, and are employed principally in hydrothorax, all kinds of dropsies, urinary calculi, rheumatism, gout, &c. In dropsies, rheumatism, and gout, the good effects are attributable to the revulsion, the irritation thus conveyed by sympathy to the capillary arteries of the affected parts stimulating them to increased contraction, and thus putting a stop, in the former to their inordinate secretion, while it may perhaps excite the radicles of the vessels by which absorption is effected, to remove what is already deposited, more quickly than they would otherwise have done (but this latter presumption, though the most current, has nothing very substantial in its favour), and in the two latter directly removing the inflammation. In urinary calculi the advantages of diuretics are similar to those derived

from purgatives when the intestines are loaded with foreign matter.

The *emmenagogues* are to the womb what the diuretics are to the kidneys, and their action is even more uncertain; they are employed only in the suppression of the natural discharge attending chlorosis.

The *diaphoretics* are quite analogous in their action to the preceding medicines, but they are, like the two last classes, very uncertain; their action is favoured by copious draughts of warm liquids, and they require the warm regimen in general, being otherwise often determined to the kidneys. Diaphoretics are used in the second stage of fevers, and inflammation in general, particularly catarrh, bronchitis, peripneumonia, dysentery, urinary calculi, lues venerea, diseases of the skin, and rheumatism. They are frequently employed also in hydrothorax, and all dropsies, in diabetes and polysarcia, and are one of the best prophylactic measures in sanguineous palsy and apoplexy; plethora being more speedily diminished, and with less uneasiness, by sweating than by any other means. Their beneficial effects in each of these diseases are easily understood.

The class of *epispastics* may include all the medicines which, when applied to the skin, constrict its capillary vessels, this constriction being followed sometimes by a mere dilatation, without any sensible discharge, at others by, first, a dilatation, and afterwards a secretion, either of lymph, which raises the cuticle in bladders, or of pus, the latter giving rise either to little excavations or pustules within the skin, and more or less distinct from each other, or to one continuous ulcer, equal in size to the space over which

the medicine has been applied. On these distinctions in their effects is founded the division of epispastics into rubifaciants, blisters, suppuratories, and caustics or escaurotics. Epispastics of one kind or another are used, sometimes to destroy morbid tissues while still indolent, or, as in scrophulous and cancerous ulcers, so to change the nature of the inflammation which they are undergoing as to render them susceptible of a cure; and for the same purpose they are frequently used in specific ulcerations of healthy tissues, as fistulous ulcers, venereal ulcers, scabies, callous ulcers of the skin, hospital gangrene, caries of the bones, wounds inflicted by the bite of rabid and venomous animals, wounds which occasion tetanus, &c., but more frequently, as in almost every kind of internal inflammations, many dropsies, hæmorrhages, &c. in order to operate by revulsion. But they are considered to be often injurious when the connection between the skin and internal part is too intimate, as in encephalitis, arachnitis of the convex surface of the brain, the stimulus thus conveyed to the inflamed part being too intense. And cantharides blisters are frequently objected to, also, on the ground of exciting cystitis, nephritis, and mild inflammation of the urethra, this medicine having a specific and too violent action on the mucous membrane of the urinary passages. The application of blisters to parts affected with erysipelas, anasarca, or even palsy, is often objected to, since the sore, it is said, seldom heals kindly, and sometimes degenerates into gangrene; in the two first, perhaps, owing to the violence of the inflammation being too great to admit of such a recovery as is necessary to effect a new secretion, and in the last to the

want of the auxiliary stimulus from the brain, which is equally necessary for the same purpose. It is probable, however, that this objection is in a great measure unfounded. Epispastics are used also in chronic palsy and amaurosis, in which their action is easily understood, as well as in angina pectoris, and other spasmodic diseases, in all which the benefit derived from them must be explained by presuming that they stimulate at second hand the capillary arteries, the relaxation of which gives rise to those inordinate accumulations of blood on which such diseases so often depend.

It is at present sufficiently well understood, that the advantage derived from this class of medicines is not in proportion to the discharge produced, but in proportion, *cæteris paribus*, to the irritation; and that it is on this that a repetition of them is in general found more effectual than promoting the discharge from one.*

Caustics are applied not only for the general purposes of epispastics, but to destroy morbid tissues, &c.

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* These remedies, in the form at least of quicklime, verdigris, &c. have been in constant use from time immemorial; but it is remarkable that the meloe, the genus which affords the substance now most constantly employed for this purpose, though used internally by Hippocrates, was not employed to raise a blister until the time of Archigenes; and this class of substances was again neglected by Galen, from his ignorance of all the stronger caustic applications. Drains, however, were of course in great reputation with the humoral pathologists, not only of ancient, but of modern times. In the days of Willis there were few persons who had not on some part of their body one or more issues, which are compared by him to the trenches by which fenny land is drained; and blisters of meloe, which had been revived by Mercuriali, were so much and so injudi-

ciously employed in almost every variety of diseases, about the time of Dr Baynard, that he ventures to surmise that " the devil himself, old Beelzebub, is nothing but a great cantharid, they act so according to his nature, to plague mankind, wherever they are applied." Issues are at present very little employed, and the bad effects of " over blistering " are at present so generally acknowledged, that their use, particularly in fever and acute inflammation, is much more circumscribed than formerly. It is only lately that the proposition of the sagacious Stork, " non suppuratio sed stimulus prodest," has been generally understood; and even yet we not unfrequently hear persons who ought to know better, continually talking about the quantity of discharge produced by epispastic medicines.

CHAP. IV.

ASTRINGENTS—TONICS—SEDATIVES.

ASTRINGENTS—DISEASES IN WHICH THEY ARE EMPLOYED—REFRIGERANTS—STIMULANTS AND TONICS—MODE OF ACTION—USE OF WINE—SEDATIVES—ANTISPASMODICS—NARCOTICS—ANTACIDS—ANTHELMINTHICS—PREPARATION OF MEDICINES—EFFECTS OF THEIR COMBINATION.

Directly opposed in their sensible effects to all the foregoing classes of medicines, are the *astringents,* the peculiar action of which seems to depend upon the constriction of the capillary arteries which they occasion, being in general as rapidly succeeded by a collapse, during which, when they have been directly applied to an inflamed part, there is a momentary increase of pain, and this again by a more or less permanent constriction, according to laws already alluded to; and that this is the case is rendered probable by the fact, that some of the strongest astringents, if given in too large quantities to allow of this secondary constriction, prove not astringent, but relaxing. Nor need it excite surprise that this class of astringents and refrigerants contains many of the medicines already enumerated among the evacuants, since it may be easily inferred, from what has been already said, as well of the action of exciting causes of disease, as of that of the medicines in question,

how slight a variation of circumstances may make the same medicine give rise at different times to directly opposite effects. Of the proper astringent medicines, some, as the blistering-fly, cubebs, pepper, whortleberry, and the balsams and turpentines, operate more remarkably upon the mucous membranes, and particularly upon those of the uriniferous passages, and others, perhaps, as pitch, on those of the dermoid tissue, while the action of most of them seems to extend almost equally to those of every tissue, though they have perhaps less influence on those of the serous tissue than on others. The proper astringents are used either internally or externally in the third stage of fevers, in many inflammations, as in ophthalmia tarsi and membranarum, cynanche tonsillaris, orchitis, chilblains, and burns; in morbid growths, as polypi of the nostrils, &c.; and in almost all inordinately increased secretions of the natural fluids (except dropsies, for a reason just assigned), as ptyalism, cholera, pyrosis, diarrhœa, inflammation of the urethra, whether virulent or mild, catarrh of the urinary bladder, lepra, psoriasis, acne, and polysarcia, inflammation of the vagina, whether virulent or mild, epistaxis, and hæmorrhages in general; and in many cases of suppuration, as ozena, purulent ophthalmia, ulceration of the larynx, and abscess of the lungs,—phthisis, and ulceration of the gullet, stomach, intestines, urinary bladder, womb, and skin. The refrigerants are employed in all inflammatory and febrile disorders.

The *stimulants* and *tonics* appear to be analogous in their action to the several evacuant medicines already spoken of; the sedatives, antispasmodics, and narcotics, to the astringents: the two former pro-

ducing, first a constriction, and afterwards a dilatation of the capillary arteries of the brain, and consequently, first a diminished, and afterwards an increased deposition of the nervous matter, upon which the constant stimulus derived from this organ to both the voluntary and involuntay muscles may be presumed to depend; and the three latter producing in like manner, first a diminished, afterwards an increased, and lastly a still more diminished, deposition of the nervous matter, on which not only this constant stimulus to both the voluntary and involuntary muscles, but sensibility and the power of thought, apparently depend. The stimulants seem to differ from the tonics principally in their effects being more sudden and violent, and in the same degree more transitory. They are employed chiefly in convalescence from acute diseases, and in diseases, chiefly functional, which arise from diminished action, and particularly in chronic palsy, asthma, asphyxia, syncope, palsy of the gullet, amaurosis, delirium tremens, and nervous palsy and apoplexy.* The tonics appear to differ from the stimulants chiefly in their effects being less sudden and more permanent. They are said in general to be more efficient if given, the vegetables in large quantities and for a short time, the mineral if given in small quantities and for a long time. There are few diseases in which tonics are not employed. Some, as mercury, and par-

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* It has been already mentioned that wine was the only stimulant employed by the ancient physicians; φαρμακον δ' ἄριστον οἶνον, says Anacreon; and he was probably right, provided always a stimulus is necessary, which is perhaps very seldom. These medicines have been most abused in modern times by Dr Brown, and in his hands and those of his disciples have been the death of thousands.

ticularly the protochloride, are used in the second stage of fevers, as well as in ophthalmia membranarum, iritis, laryngitis, cynanche trachealis, hepatitis, dysentery, peritonitis, cholera, lues venerea, rheumatism, neuralgia, arachnitis of the ventricles of the brain, and its consequences, hydro-arachnitis, and hydrocephalus, &c., its good effects appearing to arise from the additional stimulus it communicates to the dilated capillary arteries, upon which in general it appears to act in a more specific manner than any known substance, and thus approach most nearly the grand desideratum of a medicine—gifted with the essential property of making dilated capillary vessels contract. It is most probably also upon the same principles that tartar emetic, given in the large doses in which it has been recently administered in some inflammatory affections, really operates, and not, as is commonly supposed, as either a nauseant, diaphoretic, or sedative. We know, at least, that in small doses it often, like mercury, occasions inflammations, and therefore may be presumed capable of removing them. Others are used in various diseases, as Peruvian bark in gangrene, the last stage of typhus and other similar fevers, and both Peruvian bark and arsenite of potassa in all intermittent fevers, and in all inflammations which assume an intermittent type, particularly ophthalmia membranarum, odontalgia, rheumatism, and neuralgia, as well as in scrophula, tabes mesenterica, on the supervention of gangrene, and at the close of almost all febrile and inflammatory diseases; others, as iron in the scirrhous inflammation in general, and neuralgia, &c.; others, as burnt sponge and iodine in bronchocele; and others, as the chlorides of calcium

and barium in scrophula; and the greater number in rachitis, chronic palsy, as well as in angina pectoris, pertussis, syncope, palpitation of the heart, dyspepsia, amaurosis, insanity, tetanus, epilepsy, chorea, hysteria, and functional diseases in general; in all which they seem, by adding a greater stimulus to the capillary vessels, to counteract the tendency to these transitory accumulations of blood, on which the paroxysm of those diseases seems so frequently to depend. In chronic palsy, some tonics, such as the vomic nut, sumach, and leopard's bane, seem to have a specifically good effect, their tendency being to produce the directly opposite disease, or tetanus.

Of those classes of medicine which seem to lessen the action of the brain, those are called sedatives which diminish the stimulus sent by that organ more particularly to the heart; those are called antispasmodics which diminish the stimulus sent from this organ to any of the muscles of voluntary motion, already in general spasmodically affected; and those are called narcotics which at once diminish sensibility, the susceptibility of thought, and the power of voluntary motion. The *sedatives* are employed chiefly in the second stage of fevers, in acute inflammations in general, and in hypertrophy and aneurism of the heart, and aneurism in general, and in morbus cæruleus, and other organic affections of the heart.

The *antispasmodics* are used, as the name implies, chiefly in spasmodic and convulsive diseases, but sometimes also in cholera, pyrosis, diarrhœa, a tendency to miscarriage, &c., when it is an object to diminish the stimulus derived from the brain, other stimuli being inordinate; and in preternatural rigidity of the

os tincæ, strangulated intus-susceptio, and strangulated hernia, when it is an object to diminish even the natural contractions of the muscles. The diseases in which they are principally employed are angina pectoris, pertussis, palpitation of the heart, spasm of the gullet, gastrodynia, colic, hydrophobia, spasm of the sphincter ani, or spasmodic ischuria, tetanus, epilepsy, hysteria, chorea. When medicines reputed antispasmodic are of service in asthma, it is probably by their secondary effect as stimulants.

The *narcotics* are employed when the object is either to alleviate pain, when they are called anodynes, or to produce sleep, when they are called hypnotics. Under their use the first sensible effect is (the primarily constricted state of the capillary arteries of the spinal marrow and surface of the brain being too slight, like that perhaps which precedes a blush, to occasion any remarkable change) an increase of vivacity in all the animal functions, arising probably, as in myelitis and arachnitis of the convex surface of the brain, from a dilated state of the vessels, succeeded after a longer or shorter interval by diminished sensibility, and ultimately more or less perfect sleep, arising probably from a secondary constricted state of the vessels in question. Of course the action of narcotics is favoured by all the circumstances which induce natural sleep, and it is requisite that, if given at all, they be given in doses sufficiently large to produce their full effect upon the vessels, a smaller quantity than this having a tendency, for a sufficiently obvious reason, rather to dispel than to conciliate sleep. There are but few diseases in some stage of which narcotics are not employed. In continued and remittent fevers they are

not in general given with safety before perhaps the seventh day, the increased vivacity which they occasion before producing their proper effects being in the earlier stages prejudicial; but in intermittent fevers they are often used with success to prevent a paroxysm, which they seem to effect in the same way as the affusion of cold water, by relaxing at once the capillary vessels of the brain and those of the skin. In acute inflammations, with the exception of odontalgia, gastro-enteritis from acrid poisons, gonorrhœa, lues venerea, neuralgia, that form of inflammation of the smaller arteries which precedes the dry gangrene, and a few more, narcotics are in general injurious, for an obvious reason; but they are employed advantageously in the scirrhous inflammations of most organs, in calculous disorders in general, in incubus, somnambulism, insanity, and delirium tremens, in the last to act as a stimulant, and in numerous other diseases. Their use is, however, not without danger in persons predisposed to sanguineous palsy and apoplexy; and in some persons they are always productive of headach, sickness, and other inconveniences, particularly constipation, though henbane and some others are free from this last reproach.

The two last classes of medicines to be mentioned are the *antacids* and the *anthelminthics.* Of those, the action of the former is entirely chemical, and that of the latter either chemical, as in the action of lime-water, dislodging the worms by dissolving the mucilage in which they are imbedded—mechanical, as the hairs of co-witch, iron-powder, &c. doing so by friction—or poisonous, as most of the bitters and oil of turpentine, doing so directly by killing them.

Simply purgative medicines also frequently operate as anthelminthics, and are commonly used to assist the action of those substances properly so called. Antacids are used principally in urinary calculi of lithic acid, as acids are in those of the phosphates, in rachitis, gout, hyperostosis, exostosis, dyspepsia, and chlorosis; there being in all these diseases, or rather in the primary disease whence perhaps they all depend, a tendency to inordinate acidity in the secretions of the stomach. Of the particular antacids, those of magnesia are preferable when the acidity is combined with constipation, and those of lime when combined with diarrhœa.

Medicines, in order to adapt them to the different methods in which they are administered, are prepared either separately or conjointly, in the form of powders, pills, lozenges, electuaries, conserves, solutions, infusions, decoctions, emulsions, mixtures, inspissated juices or extracts, syrups, vinegars, wines, tinctures, volatile oils, distilled water, spirits, plasters, ointment, cerates, and liniments. The general rules for preparing these several forms of medicine need not be detailed. In prescribing compound medicines, it is proper continually to keep in mind that the properties of the compound are by no means always the mean of the properties of the ingredients; but that, while sometimes these latter properties are corrected or neutralized by such combinations, they are at other times considerably increased, or other entirely new properties are superadded. It is sufficiently well known that two or more medicines of the same description, and particularly diuretics, given in combination, frequently produce a much greater effect than

the same doses of each individually would have done; and the influence exerted by one class of medicines upon those of a different character, not only generally, but individually, is so varied, that it is almost impossible to say *a priori* what particular indications such compound medicines are calculated to fulfil. It hence follows that we should be very cautious in excluding any medicine, however fanciful, the efficacy of which is supported by experience; and perhaps the old propensity for excessive complication in medical prescriptions, and for a vast choice of them, was not more reprehensible than the new one for excessive simplification and paucity. We know nothing of the specific properties of any medicine, whether simple or compound, but by its results; and we are no more justified in concluding that any composition is inadequate to effect the certain purpose for which it is celebrated, because its ingredients are respectively inert, than we should be in denying the violently explosive property of gunpowder, because neither nitre, carbon, nor sulphur are severally possessed of that property; nor is it unreasonable to suppose that a very slight variation in the ingredients of any compound medicine, or in their proportions, may sometimes make a considerable difference in its action. How can we tell, for example, what new compounds may result from the mixture of opium, ipecacuan, and sulphate of potash, in Dover's powder,—or how the emetine meconate of morphia and salt of potash may mutually affect each other? and if this be true with respect to the compounds formed by artificially mixing different roots, gum-resins, and salts together, it is still more

so with respect to those roots and gum-resins themselves, composed as they are of so many different proximate principles put together by the hand of nature; and this reflection should make us very jealous of rejecting certain of these principles on the presumption that they are inert, and of relying upon others upon the presumption that they alone are active.

When we reflect on the endless diversities in the idiosyncrasies of the human body, as to the more or less specific action of any medicine, simple as well as compound, although we may not sigh, like Van Mons, for their restoration "to their primitive state of all those bygone receipts whose credit time too spared," we will yet certainly regret that the "*novæ vires mixturæ variorum*" of Gaubius, the new virtues of compounds,—analogous "to the harmony of colours and sounds" of Ferriar,—the adjective as well as the substantive power of the "tertium quid" of Shearman,—should ever be sacrificed to a fastidious science, and that any compound medicine of acknowledged efficacy should ever be wantonly expunged and voted inert because we cannot easily explain why it should be otherwise; "præstat," says Cicero, "copia quam penuria." It is the same lopping and pruning spirit, aided by the recent improvement in the art of chemical analysis, which has led to the rejection in many cases, not only of compounds in general, but even of crude simples, in favour of one or two of their proximate principles, in which we are pleased to consider that all their virtues reside; and there can be little doubt that, if their improvement proceed much farther, a middle-sized man will not only be able to take

all the medicine he may have occasion for on the point of a needle, but, instead of sitting down, as at present, to his pound and a half of mutton chop and pot of porter, will swallow for his dinner a fine grain pill composed of equal parts of ovine and cerevisine, or some such matters which science has yet to be delivered of.

THE END.

ERRATA.

Page 103, line 10, note, *for* " Araneiwirkung," *read* " Arzneiwirkung."
—— 107, supply the word " EDITORS " at the end of the note.
—— 117, line 6, note †, *for* " prima glottidis," *read* " rima glottidis."
—— 135, line 17, *for* " Trallis," *read* " Tralles."
—— 167, line 5 from bottom, *for* " Movement du Sang dans les Vaisseux," *read* " Mouvement du Sang dans les Vaisseaux."
—— 228, supply the word " EDITORS " at the end of the note.
—— 291, line 6, *for* " Doublet," *read* " Double."
—— 314, line 3 from bottom, *for* " Des leçons les," *read* " Les leçons des."
—— 336, line 6, *for* " Philip," *read* " Phillips."
—— 360, line 14, omit " in the normal state of the parenchyma."
—— 408, line 13, *for* " hepatized," *read* " hebetized."
—— 445, line 8, *for* " Breras," *read* " Brera."